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ABSTRACT

Designed primarily for adult literacy teachers and tutors, this curriculum describes the content of what should be taught in numeracy programs in order to meet the individual needs of adults through the selection and teaching of skills appropriate to those adults' needs. An introduction describes national standards and qualifications, learners, and how to use the curriculum, and provides a key to the curriculum reference system. It is followed by a summary page showing progression between capabilities at each level and pages that use the curriculum reference system to provide a detailed account of the progression between curriculum elements. The curriculum consists of these three units: number; measures, shape, and space; and handling data. The curriculum is organized across double pages as follows: national standard for adult numeracy; curriculum elements that are made up of the descriptors for each standard and additional skills and knowledge necessary for the achievement of the standard; example of a relevant literacy task attached to each curriculum element; sample activities; guidance on techniques and approaches for teacher use; and curriculum referencing that breaks the core curriculum down into its component parts (curriculum section, curriculum sub-section, level, and curriculum element). A glossary is appended. (YLB)

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Adult Numeracy core curriculum

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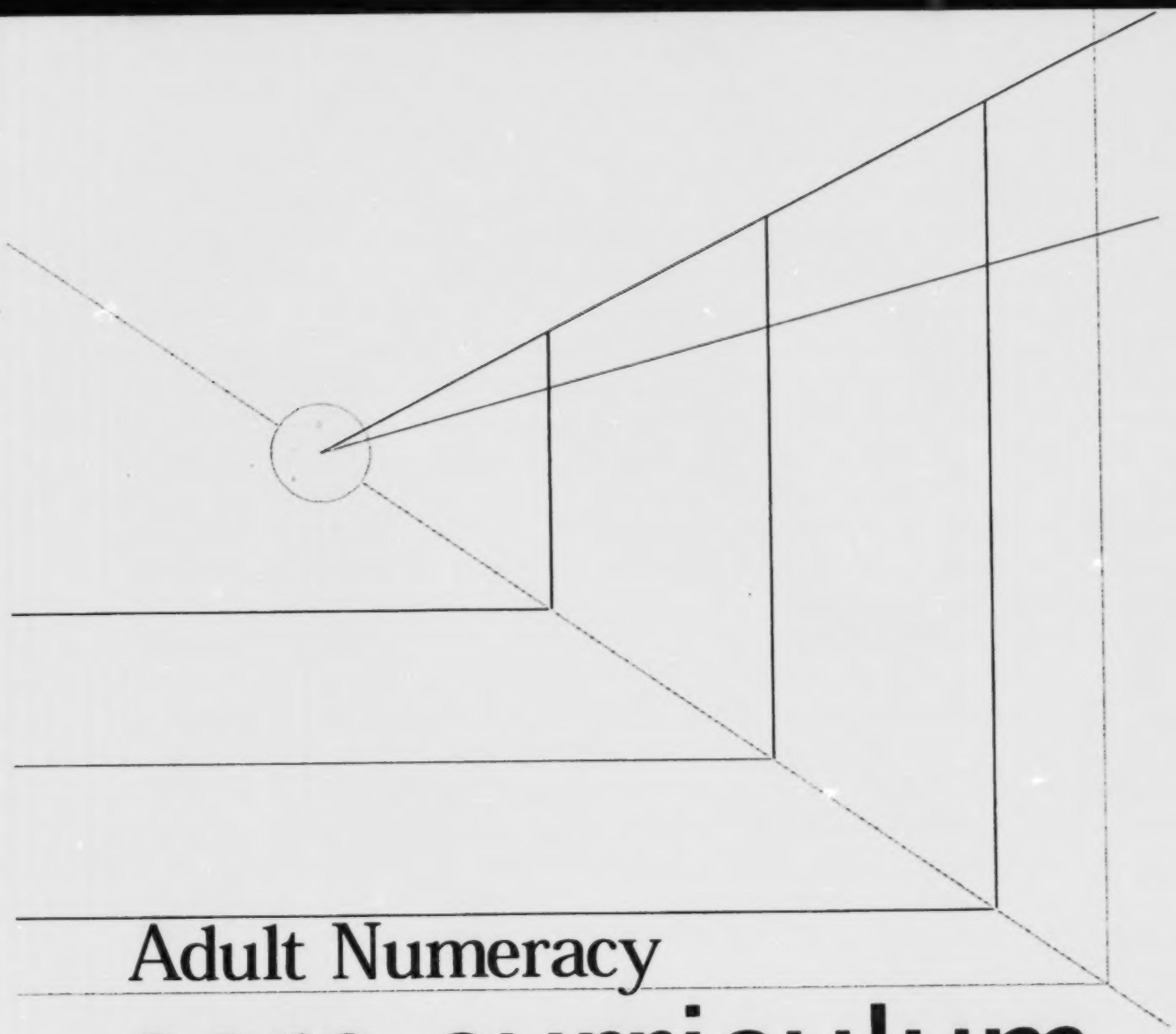

Adult Numeracy
core curriculum

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Foreword

Improving the nation's literacy and numeracy skills is one of the Government's top priorities. We have already brought about significant improvements at school level and want to ensure that adults have good opportunities to develop their skills too. We are in the process of introducing a range of new measures to help them.

One of our first tasks is to improve the quality and consistency of provision. This new adult literacy and numeracy curriculum, based on the national standards developed by the Qualifications and Curriculum Authority, will be central to achieving that goal.

It provides teachers with a comprehensive framework to help identify and meet each person's individual learning needs, including examples of teaching strategies they can use. For learners, it will ensure that, no matter which type of course they choose or where the learning takes place, they can be confident of a common approach and effective support.

I am sure that this curriculum will prove an invaluable tool. It is designed primarily for adult literacy and numeracy teachers and tutors, but it will also be highly useful to programme managers, developers of literacy and numeracy training and materials, and to the growing body of organisations and individuals involved in addressing adult literacy and numeracy issues.

Malcolm Wicks MP,
Minister for Lifelong Learning

Introduction

A national strategy to tackle the literacy and numeracy needs of adults was launched by the government in the Autumn of 2000. Following the report of Sir Claus Moser's Working Group, *A Fresh Start – Improving Literacy and Numeracy* (DfEE, 1999), the government committed itself, the education services and a cross-section of agencies and national bodies to a major reduction in the number of adults who struggle with basic reading, writing, spelling and maths.

The strategy includes national standards of adult literacy and numeracy to ensure consistency, a core curriculum to clarify what teachers should teach to enable learners to reach those standards, a new system of qualifications to measure achievement against the standards, and improved quality and diversity of learning opportunities to meet the needs of a wide range of learners. This strategy sets a challenge to us all.

The adult literacy and numeracy core curriculum

The new adult literacy and numeracy core curriculum is central to the national strategy. It sets out the entitlement to learning for all adults who have difficulties with literacy and numeracy. It describes the content of what should be taught in literacy and numeracy programmes in: further and adult education; the workplace and programmes for the unemployed; prisons; community-based and family literacy and numeracy programmes. It assists teachers to meet the individual needs of adults through the selection and teaching of skills appropriate to those adults' needs. For the first time, adults and the teachers who work with them have a clear set of skills required to meet national standards, together with the knowledge and understanding that underpin those skills, supported by sample strategies to develop them.

'One of the crucial elements of the proposed strategy must be clarity about the skills, knowledge and understanding that anyone needs to be literate and numerate in the modern world. These skills need to be enshrined in a new curriculum, with well-developed and understood standards.'

Chapter 10 (A New Basic Skills Curriculum and a New System of Qualifications), *A Fresh Start*, February 1999

The core curriculum has been written primarily for use by adult literacy and numeracy teachers and tutors. However, it will be an important document for programme managers and developers, for those involved in research and for a wider group of those bodies and individuals that are increasingly concerned with the adult literacy and numeracy agenda.

The core curriculum is based on the national standards for adult literacy and numeracy developed by the Qualifications and Curriculum Authority (QCA) in 2000. Its publication follows national consultation with teachers and managers of adult literacy and numeracy programmes, and relevant national bodies. The core curriculum draws heavily on existing and planned curricula and strategies in this country and overseas, specifically:

- the twin frameworks for teaching literacy and numeracy that are elaborated in the National Literacy Strategy and the National Numeracy Strategy;
- the new key skills units of communication and application of number developed by QCA;
- the revised National Curriculum for English and mathematics introduced in schools in September 2000;

- adult literacy and numeracy curricula and initiatives that have been developed in other countries (and, in particular, in the United States of America, Australia, Canada and France).

'As far as possible the curriculum should be context free – the core should set out the skills to be taught. The context in which they are taught is a matter for the teacher and learner to decide, particularly as different adults have different motivations'

A Fresh Start, February 1999

As the national strategy unfolds, the core curriculum will be reviewed and updated to build in new and revised ways of delivering these skills in order to fulfil the vision outlined in *A Fresh Start*. For teachers, therefore, the new core curriculum is both a key support and also a challenge.

Adult literacy and numeracy teachers will be able to use the core curriculum to develop learning programmes. It will help them to:

- use information from diagnostic assessment to identify learners' skills, both those that they already have and those that they need;
- draw those elements from the curriculum into the learning plan and assessment regime;
- use their knowledge of the learners' context and priorities to find relevant applications where learners can practise the skills and knowledge they are acquiring;
- follow the progression through the standards and the curriculum elements to build a formative and summative assessment regime into the learning plan.

Inclusivity and access

The adult literacy and numeracy core curriculum shares the basic principles of inclusivity and access that are laid down in the National Curriculum for schools:

> Education is . . . a route to equality of opportunity for all, a healthy and just democracy, a productive economy, and sustainable development. Education should reflect the enduring values that contribute to these ends. These include valuing ourselves, our families and other relationships, the wider groups to which we belong, the diversity in our society and the environment in which we live.
>
> . . . (Education) must enable us to respond positively to the opportunities and challenges of the rapidly changing world in which we live and work. In particular, we need to be prepared to engage as individuals, parents, workers and citizens with economic, social and cultural change, including the continued globalisation of the economy and society, with new work and leisure patterns and with the rapid expansion of communication technologies.
>
> The . . . Curriculum secures . . . for all, irrespective of social background, culture, race, gender, differences in ability and disabilities, an entitlement to a number of areas of learning and to develop knowledge, understanding, skills and attitudes necessary for their self-fulfilment and development as active and responsible citizens.
>
> ('The school curriculum and the National Curriculum: values, aims and purposes', *The National Curriculum*, DfEE, 1999)

Some adults will have special requirements. The following access statement applies to the standards at each level:

Adults with a disability may have special learning requirements and be unable to demonstrate some of the capabilities or skills specified in the standards. As a reasonable adjustment and to aid access, it is recommended that alternative methods are investigated to allow individual to demonstrate their abilities.

Curriculum developers and qualification designers are expected to produce guidance for centres on recognising special learning requirements. This guidance should be supported by a framework for identifying and adopting appropriate alternative approaches.

('Access to the Standards', *National standards for adult literacy and numeracy*, QCA, 2000)

Guidance on specialist diagnosis of learning needs and access to the curriculum for learners with physical disabilities, sensory impairment and learning disabilities will be published separately.

The national standards for adult literacy and numeracy

The standards describe adult literacy and numeracy within the definition expressed in *A Fresh Start:*

'the ability to read, write and speak in English and to use mathematics at a level necessary to function at work and in society in general.'

The standards provide a map of the range of skills and capabilities that adults are expected to need in order to function and progress at work and in society. A separate set of standards has been produced for each of the basic skills of literacy and numeracy.

Literacy covers the ability to:

- speak, listen and respond
- read and comprehend
- write to communicate.

Numeracy covers the ability to:

- understand and use mathematical information
- calculate and manipulate mathematical information
- interpret results and communicate mathematical information.

Separate curricula have been developed and published for literacy and for numeracy.

The national qualifications framework

The national standards for adult literacy and numeracy are specified at three levels: Entry level, Level 1 and Level 2. Levels 1 and 2 are aligned to the key skills of communication and application of number (this alignment is signposted on the left-hand page of the curriculum document at these levels). Entry level is further divided into three sub-levels: Entry 1, Entry 2 and Entry 3. Entry level has been set out in this way to describe in detail the small steps required for adults to make progress. This sub-division also signals a clear alignment of the skill levels with levels 1, 2 and 3 of the National Curriculum.

The three levels of the national standards for adult literacy and numeracy correspond to the levels of demand of qualifications in the national qualifications framework, illustrated in Table 1.

Table 1. The national qualifications framework

		Key skills Level 5	National qualifications framework Level 5
		Key skills Level 4	National qualifications framework Level 4
		Key skills Level 3	National qualifications framework Level 3
	Literacy/Numeracy Level 2	Key skills Level 2	National qualifications framework Level 2
National Curriculum Level 5	Literacy/Numeracy Level 1	Key skills Level 1	National qualifications framework Level 1
National Curriculum Level 4			
National Curriculum Level 3	Literacy/Numeracy Entry 3		Entry Level
National Curriculum Level 2	Literacy/Numeracy Entry 2		
National Curriculum Level 1	Literacy/Numeracy Entry 1		

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Who are the learners?

Over 7 million adults in England have difficulties with literacy and numeracy. This means that they are unable to read and write very well and have difficulty doing some of the simplest tasks such as writing a letter, reading a piece of text or calculating change – tasks that most of us take for granted.

But we know that the 7 million adults struggling with literacy and numeracy are not a homogeneous group. They're 7 million individuals with different needs, attitudes and interests. We also know that they don't all have the same degree of difficulties with literacy and numeracy.

Research by the Basic Skills Agency has identified three attainment groups that make up the 7 million:

- a higher-level group (just over 4 million adults) who need fairly modest help to 'brush up' their skills to the required level;
- a middle-level group (just under 1.5 million adults) who have greater difficulty and need more specific and in-depth help;
- a lower-level group (just under 1.5 million adults) who require intensive teaching by specialist teachers.

In addition, there are an estimated 500,000 adults for whom English is an additional language. A separate but related curriculum has been developed for this group of learners.

Many of those with low levels of literacy and numeracy are working. For example, recent research showed that, among the 7 million adults with very low or low literacy, the following proportions were employed:

- 57 per cent of men in their twenties
- 72 per cent of men in their thirties
- 74 per cent of women in their forties.[1]

However, we know that low levels of literacy and numeracy limit the employment opportunities available to individuals. A 1993 survey found that:

- people without any Entry level skills had access to only one in 50 of lower level jobs;
- those with Entry level skills had access to 50 per cent;
- those with Level 1 skills had access to 75 per cent.[2]

As jobs continue to change, and new technological, quality and work organisation systems are introduced, this situation is likely to get worse.

---

1. *Literacy, Leaving School and Jobs: the effect of poor basic skills on employment in different age groups*, The Basic Skills Agency, 1999
2. *Basic Skills and Jobs*, Institute for Employment Studies, 1993

Using the adult numeracy core curriculum

The new adult numeracy core curriculum is organised across double pages as follows:

National standard for adult numeracy

Each of the standards for adult numeracy is listed in the adult numeracy core curriculum. A summary page showing progression between capabilities at each level is included on pages 12–13.

Curriculum element

The adult numeracy core curriculum is broken down into the skills and knowledge of number, measures, shape and space, and handling data required to meet the standards. The curriculum elements are made up of **descriptors** (the term given to skills listed underneath each standard at each level in the national standards for adult literacy and numeracy published by QCA) from the standards, as well as **additional skills and knowledge** necessary for the achievement of the standards. Descriptors are shown in bold; additional skills and knowledge are in a lighter typeface.

(At Levels 1 and 2, the curriculum's alignment to the key skills of application of number is given on the left-hand page.)

Example

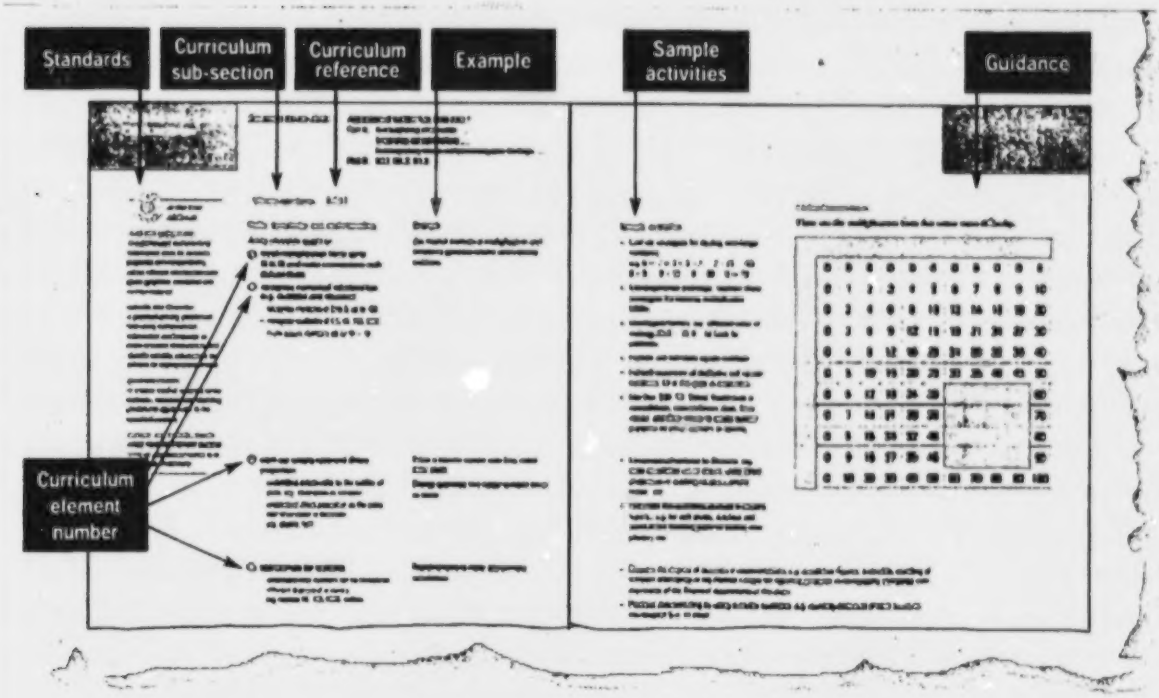
An example of a relevant numeracy task is attached to each of the curriculum elements. The examples are not intended to define or prescribe tasks, but to make the demands of the level clear.

Sample activities

The right-hand pages list sample activities that can be used to develop and practise the skills and knowledge related to each curriculum element.

Guidance

The right-hand pages also contain guidance on techniques and approaches that teachers will use to develop numeracy.



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Curriculum referencing

To assist teachers in their planning, the adult numeracy core curriculum uses a reference system (indicated on the sample double page on the previous page) that breaks the core curriculum into its component parts of: curriculum section, curriculum sub-section, level and curriculum element. Pages 14–19 use this reference system to provide a detailed account of the progression between curriculum elements across the levels.

Key to reference system

Curriculum sections and sub-sections

Number	N	Measures, shapes and space	MSS	Handling data	HD
Whole numbers	N1	Common measures	MSS1	Data	HD1
Fractions, decimals and percentages	N2	Shape and Space	MSS2	Probability	HD2

Glossary

In addition, the adult numeracy core curriculum contains a glossary of the terms used. It includes mathematical terms, and qualifying terms such as *straightforward* and *everyday*.

Number, Measures, Shape and Space, Handling Data

The adult numeracy core curriculum follows a model based on the National Curriculum for mathematics:

- **number** includes numbers and the number system, and calculations
- **measures, shape and space** includes common measures of money, time, temperature, distance, length, weight, capacity, perimeter, area and volume, and shape and position
- **handling data** includes data and statistical measures, and probability.

Learners need to develop skills, knowledge and understanding in each of these areas of mathematics. An understanding of numbers and the relationships between them, and an ability to manipulate numbers efficiently and confidently, is critical for success in other areas of the curriculum. For example, a learner might be able to understand the concept of area and how it is calculated, but success in solving area problems also requires the ability to multiply numbers efficiently; similarly, the ability to solve problems with money and metric measures requires the ability to manipulate decimal numbers. However, this does not mean that skills must be taught sequentially. Learners' previous knowledge and experience can be drawn upon to develop new skills and understanding; for example, familiarity with money written in decimal notation can form the basis for understanding decimal numbers, which can then be applied in other areas of the curriculum.

In following the adult numeracy core curriculum, it is critical that teachers identify opportunities for making connections between different areas of the core curriculum, both in terms of linked skills and mathematical concepts. Teaching a single skill in isolation, for

example teaching a single strategy to find 10% of an amount of money, may meet a learner's immediate needs. But teachers could then make connections – in this case to division and place value, to fractions and decimals – so that the learner can develop the mathematical understanding that leads to independent learning and the development of transferable skills.

Problem solving

The application of skills to solving problems in a range of contexts will enable learners to demonstrate capabilities defined in the national standards for adult numeracy. Problem-solving skills cannot be taught, learned or practised in isolation; they are an integral part of the adult numeracy core curriculum. Teachers need to provide learners with opportunities to develop skills in solving problems involving number, measures, shape and data.

Discussion is an important part of developing problem-solving skills. It helps learners to understand different approaches to solving problems, to identify what information is needed, to make decisions about which operations and strategies to use, and to understand how to organise and check results. Explanation is equally important: asking learners to explain their approaches, methods and answers promotes active learning through providing opportunities for learners to use mathematical vocabulary, identify difficulties and confirm their understanding. It can also help the teacher to identify misconceptions that might not be revealed through written work.

The learner's context

'Learners should be able to develop the skills common to them all, using the interests, the materials and the activities that most closely match their needs'
A Fresh Start

If the adult numeracy core curriculum is to be successful, it is important that:

- the learner is clear about what they are learning and what the activities they are undertaking are designed to teach – a clear and consistently delivered curriculum helps with this;
- the learner brings the context that will be the ultimate 'proving' ground for their improved skills;
- the learner is sure that the skills and knowledge that they are learning are helping them to use their numeracy in the range of ways they want.

The curriculum elements must be clear and used *with* learners. The aim must be that learners develop the concepts and the language that will help them make sense of their learning and go on doing it. Evidence shows that the inclusion of explicit curriculum targets in learning programmes has resulted in a clearer identification of outcomes *by learners* as well as by teachers, and in better attendance and progression by learners.

The skills and knowledge elements in the adult numeracy core curriculum are generic. They are the basic building blocks that everyone needs in order to use numeracy skills effectively in everyday life. What is different is how adults use these skills and the widely differing past experiences that they bring to their learning. This is the *context* that the learner provides. Each individual learner will come with their own set of priorities and requirements, and these must be the starting point of their learning programme development.

The section in the national standards on the 'Structure of the standards' provides examples of the use of adult literacy and numeracy in different contexts under the following headings:

- citizen and community
- economic activity, including paid and unpaid work
- domestic and everyday life
- leisure
- education and training
- using ICT in social roles

These are examples of the social roles and activities in which adults need literacy and numeracy in order to function independently and exercise choice. This adult numeracy core curriculum provides the skills framework, the learner provides the context, and the teacher needs to bring them together in a learning programme using relevant materials at the appropriate level, to support learners in achieving their goals.

'In short, the curriculum is not a series of rigid lesson plans to be taught by every teacher and followed by every learner'. *A Fresh Start*

Numeracy

'Mathematics equips pupils with a uniquely powerful set of tools to understand and change the world' *(The National Curriculum,* QCA). Changing the world may not be the immediate goal of adult learners, but being numerate – acquainted with the basic principles of mathematics – is essential to functioning independently within the world. In everyday life we are confronted with numbers, from getting on the right bus or putting coins in a parking meter, to choosing the best deal on a mobile phone or a pension plan. Increasingly, we are bombarded with charts and statistics to inform us, persuade us, impress us, convince us – without some understanding of how to interpret data it is difficult to see how we can be independent citizens and consumers. And, in employment, research has indicated that numeracy, even more than literacy, has a powerful effect on earnings.

It is important that, as well as developing skills in manipulating numbers, learners understand and make connections between different areas of mathematics so that they are able to apply skills to solving problems in a range of contexts. In the process, they may also begin to discover the joy and power of mathematics.

At three I fell in love with numbers. It was sheer ecstasy for me to do sums and get the right answers. Numbers were toys with which I could play. In them I found emotional security; two plus two always made, and would always make, four – no matter how the world changed.

Shakuntala Devi, Author

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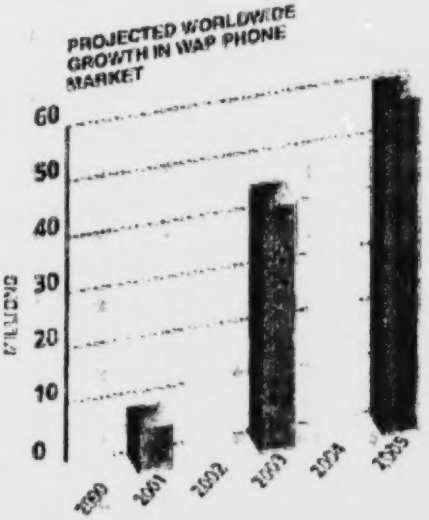
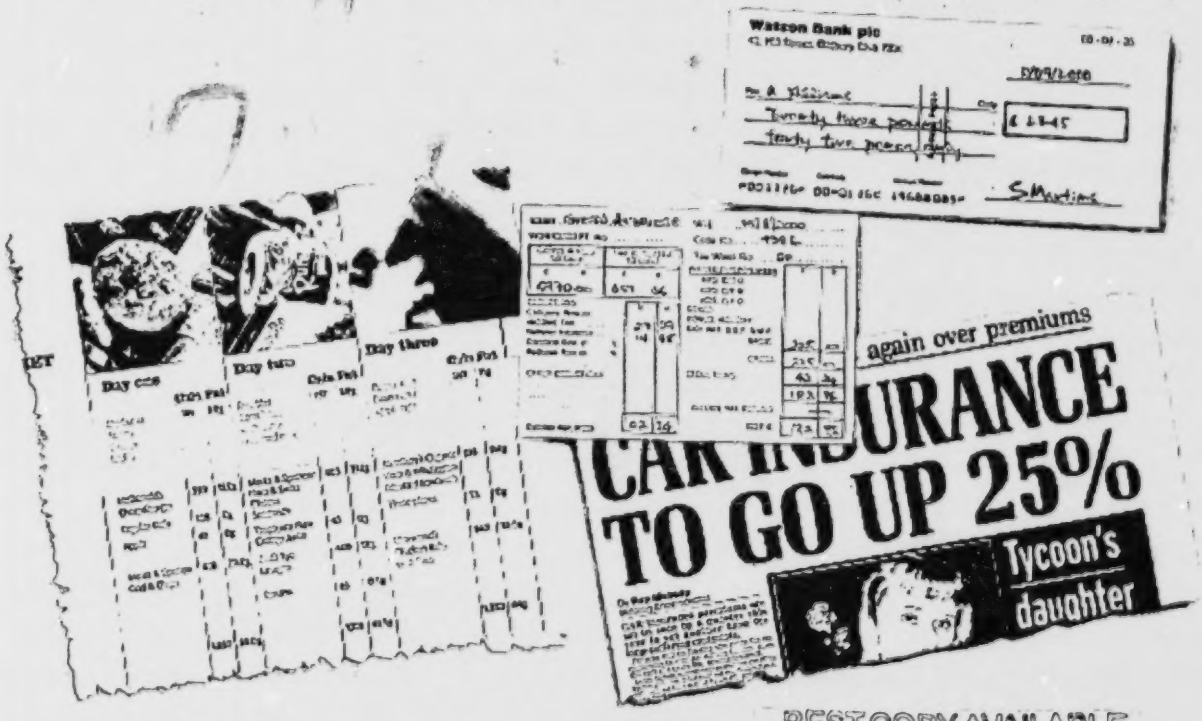
Facts and figures illustrating progress fly across frontiers like guided missiles directed at people's minds. And, of course, those who lag behind in such progress are the most exposed to this propaganda.

HG Wells



I couldn't book holidays. I couldn't write cheques if they were over £13. I'd learnt to spell out figures from a children's book but it only went up to 13.

Sue Torr, *Adult Learner*



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The progression between capabilities

Entry Level		
Understanding and using mathematical information *At this level, adults can*	*Understanding and using mathematical information* *At this level, adults can*	*Understanding and using mathematical information* *At this level, adults can*
read and understand information given by numbers and symbols in simple graphical, numerical and written material	read and understand information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material	read and understand information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material
specify and describe a practical problem or task using numbers and measures	specify and describe a practical problem or task using numbers, measures and simple shapes to record essential information	specify and describe a practical problem or task using numbers, measures and diagrams to collect and record relevant information
Calculating and manipulating mathematical information *At this level, adults can*	*Calculating and manipulating mathematical information* *At this level, adults can*	*Calculating and manipulating mathematical information* *At this level, adults can*
generate results which make sense and use given methods and given checking procedures appropriate to the specified purpose	generate results to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose	generate results to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose
Interpreting results and communicating mathematical information *At this level, adults can*	*Interpreting results and communicating mathematical information* *At this level, adults can*	*Interpreting results and communicating mathematical information* *At this level, adults can*
present and explain results which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures	present and explain results which meet the intended purpose using appropriate numbers, simple diagrams and symbols	present and explain results which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

The progression between capabilities

Understanding and using mathematical information *At this level, adults can*	*Understanding and using mathematical information* *At this level, adults can*
read and understand straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material	read and understand mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material
specify and describe a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome	specify and describe a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity
Calculating and manipulating mathematical information *At this level, adults can*	*Calculating and manipulating mathematical information* *At this level, adults can*
generate results to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose	generate results to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose
Interpreting results and communicating mathematical information *At this level, adults can*	*Interpreting results and communicating mathematical information* *At this level, adults can*
present and explain results which meet the intended purpose using an appropriate format to a given level of accuracy	present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Number: the progression between curriculum elements

Entry Level		
Whole numbers	**N1/E1.1** Count reliably up to 10 items **N1/E1.2** Read and write numbers up to 10, including zero **N1/E1.3** Order and compare numbers up to 10, including zero **N1/E1.4** Add single-digit numbers with totals to 10 **N1/E1.5** Subtract single-digit numbers from numbers up to 10 **N1/E1.6** Interpret ■, − and = in practical situations for solving problems **N1/E1.7** Use a calculator to check calculations using whole numbers	**N1/E2.1** Count reliably up to 20 items **N1/E2.2** Read, write, order and compare numbers up to 100 **N1/E2.3** Add and subtract two-digit whole numbers **N1/E2.4** Recall addition and subtraction facts to 10 **N1/E2.5** Multiply using single-digit whole numbers **N1/E2.6** Approximate by rounding to the nearest 10 **N1/E2.7** Use and interpret ■, − , ● and ■ in practical situations for solving problems **N1/E2.8** Use a calculator to check calculations using whole numbers
Fractions, decimals and percentages		**N2/E2.1** Read, write and compare halves and quarters of quantities **N2/E2.2** Find halves and quarters of small numbers of items or shapes

The progression between curriculum elements

N1/E3.1 Count, read, write, order and compare numbers up to 1000 **N1/E3.2** Add and subtract using three-digit whole numbers **N1/E3.3** Recall addition and subtraction facts to 20 **N1/E3.4** Multiply two-digit whole numbers by single-digit whole numbers **N1/E3.5** Recall multiplication facts (e.g. multiples of 2, 3, 4, 5, 10) **N1/E3.6** Divide two-digit whole numbers by single-digit whole numbers and interpret remainders **N1/E3.7** Approximate by rounding numbers less than 1000 to the nearest 10 or 100 **N1/E3.8** Estimate answers to calculations **N1/E3.9** Use and interpret ■, −, ▪, ▪▪ and ▬ in practical situations for solving problems	**N1/L1.1** Read, write, order and compare numbers, including large numbers **N1/L1.2** Recognise negative numbers in practical contexts (e.g. temperatures) **N1/L1.3** Add, subtract, multiply and divide using efficient written methods **N1/L1.4** Multiply and divide whole numbers by 10 and 100 **N1/L1.5** Recall multiplication facts up to 10 ▪ 10 and make connections with division facts **N1/L1.6** Recognise numerical relationships (e.g. multiples and squares) **N1/L1.7** Work out simple ratio and direct proportion **N1/L1.8** Approximate by rounding **N1/L1.9** Estimate answers to calculations	**N1/L2.1** Read, write, order and compare positive and negative numbers of any size in a practical context **N1/L2.2** Carry out calculations with numbers of any size using efficient methods **N1/L2.3** Calculate ratio and direct proportion **N1/L2.4** Evaluate expressions and make substitutions in given formulae in words and symbols to produce results
N2/E3.1 Read, write and understand common fractions (e.g. ¾, ⅔, 1/10) **N2/E3.2** Recognise and use equivalent forms (e.g. 5/10 ▬ ½) **N2/E3.3** Read, write and understand decimals up to two decimal places in practical contexts (such as: common measures to one decimal place, e.g. 1.5 m; money in decimal notation, e.g. £2.37) **N2/E3.4** Use a calculator to calculate using whole numbers and decimals to solve problems in context, and to check calculations	**N2/L1.1** Read, write, order and compare common fractions and mixed numbers **N2/L1.2** Find parts of whole number quantities or measurements (e.g. ⅓ or ¼) **N2/L1.3** Recognise equivalencies between common fractions, percentages and decimals (e.g. 50% ▬ ½, 0.25 ▬ ¼) and use these to find part of whole-number quantities **N2/L1.4** Read, write, order and compare decimals up to three decimal places **N2/L1.5** Add, subtract, multiply and divide decimals up to two places **N2/L1.6** Multiply and divide decimals by 10, 100 **N2/L1.7** Approximate decimals by rounding to a whole number or two decimal places **N2/L1.8** Read, write, order and compare simple percentages, and understand simple percentage increase and decrease **N2/L1.9** Find simple percentage parts of quantities and measurements **N2/L1.10** Find simple percentage increase and decrease **N2/L1.11** Use a calculator to calculate efficiently using whole numbers, fractions, decimals and percentages	**N2/L2.1** Use fractions to order and compare amounts or quantities **N2/L2.2** Identify equivalencies between fractions, decimals and percentages **N2/L2.3** Evaluate one number as a fraction of another **N2/L2.4** Use fractions to add and subtract amounts or quantities **N2/L2.5** Order, approximate and compare decimals when solving practical problems **N2/L2.6** Add, subtract, multiply and divide decimals up to three places **N2/L2.7** Order and compare percentages and understand percentage increase and decrease **N2/L2.8** Find percentage parts of quantities and measurements **N2/L2.9** Evaluate one number as a percentage of another **N2/L2.10** Use a calculator to calculate efficiently using whole numbers, fractions, decimals and percentages

Measures, shape and space: the progression between curriculum elements

Entry Level		
Common measures	**MSS1/E1.1** Recognise and select coins and notes **MSS1/E1.2** Relate familiar events to: times of the day; days of the week; seasons of the year **MSS1/E1.3** Describe size and use direct comparisons for the size of at least two items **MSS1/E1.4** Describe length, width, height, and use direct comparisons for length, width and height of items **MSS1/E1.5** Describe weight and use direct comparisons for the weight of items **MSS1/E1.6** Describe capacity and use direct comparisons for the capacity of items	**MSS1/E2.1** Make amounts of money up to £1 in different ways using 1p, 2p, 5p, 10p, 20p and 50p coins **MSS1/E2.2** Calculate the cost of more than one item and the change from a transaction, in pence or in whole pounds **MSS1/E2.3** Read and record time in common date formats **MSS1/E2.4** Read and understand time displayed on analogue and 12-hour digital clocks in hours, half hours and quarter hours **MSS1/E2.5** Read, estimate, measure and compare length using common standard and non-standard units (e.g. metre, centimetre, paces) **MSS1/E2.6** Read, estimate, measure and compare weight using common standard units (e.g. kilogram) **MSS1/E2.7** Read, estimate, measure and compare capacity using common standard and non-standard units (e.g. litre, cupful) **MSS1/E2.8** Read and compare positive temperatures in everyday situations such as weather charts **MSS1/E2.9** Read simple scales to the nearest labelled division
Shape and space	**MSS2/E1.1** Recognise and name common 2-D and 3-D shapes **MSS2/E1.2** Understand everyday positional vocabulary (e.g. between, inside or near to)	**MSS2/E2.1** Recognise and name 2-D and 3-D shapes **MSS2/E2.2** Describe the properties of common 2-D and 3-D shapes **MSS2/E2.3** Use positional vocabulary

The progression between curriculum elements

MSS1/E3.1 Add and subtract sums of money using decimal notation **MSS1/E3.2** Round sums of money to the nearest £ and 10p and make approximate calculations **MSS1/E3.3** Read, measure and record time **MSS1/E3.4** Read and interpret distance in everyday situations **MSS1/E3.5** Read, estimate, measure and compare length using non-standard and standard units **MSS1/E3.6** Read, estimate, measure and compare weight using non-standard and standard units **MSS1/E3.7** Read, estimate, measure and compare capacity using non-standard and standard units **MSS1/E3.8** Choose and use appropriate units and measuring instruments **MSS1/E3.9** Read, measure and compare temperature using common units and instruments	**MSS1/L1.1** Add, subtract, multiply and divide sums of money and record **MSS1/L1.2** Read, measure and record time in common date formats and in the 12-hour and 24-hour clock **MSS1/L1.3** Calculate using time **MSS1/L1.4** Read, estimate, measure and compare length, weight, capacity and temperature using common units and instruments **MSS1/L1.5** Read, estimate, measure and compare distance **MSS1/L1.6** Add and subtract common units of measure within the same system **MSS1/L1.7** Convert units of measure in the same system **MSS1/L1.8** Work out the perimeter of simple shapes **MSS1/L1.9** Work out the area of rectangles **MSS1/L1.10** Work out simple volume (e.g. cuboids)	**MSS1/L2.1** Calculate with sums of money and convert between currencies **MSS1/L2.2** Calculate, measure and record time in different formats **MSS1/L2.3** Estimate, measure and compare length, distance, weight and capacity using metric and, where appropriate, imperial units **MSS1/L2.4** Estimate, measure and compare temperature, including reading scales and conversion tables **MSS1/L2.5** Calculate with units of measure within the same system **MSS1/L2.6** Calculate with units of measure between systems, using conversion tables and scales, and approximate conversion factors **MSS1/L2.7** Understand and use given formulae for finding perimeters and areas of regular shapes (e.g. rectangular and circular surfaces) **MSS1/L2.8** Understand and use given formulae for finding areas of composite shapes (e.g. non-rectangular rooms or plots of land) **MSS1/L2.9** Understand and use given formulae for finding volumes of regular shapes (e.g. a cuboid or cylinder) **MSS1/L2.10** Work out dimensions from scale drawings (e.g. 1:20)
MSS2/E3.1 Sort 2-D and 3-D shapes to solve practical problems using properties (e.g. lines of symmetry, side length, angles)	**MSS2/L1.1** Solve problems using the mathematical properties of regular 2-D shapes (e.g. tessellation or symmetry) **MSS2/L1.2** Draw 2-D shapes in different orientations using grids (e.g. in diagrams or plans)	**MSS2/L2.1** Recognise and use common 2-D representations of 3-D objects (e.g. in maps and plans) **MSS2/L2.2** Solve problems involving 2-D shapes and parallel lines (e.g. in laying down carpet tiles)

Handling data: the progression between curriculum elements

Entry Level		
Data and statistical measures	**HD1/E1.1** Extract simple information from lists **HD1/E1.2** Sort and classify objects using a single criterion **HD1/E1.3** Construct simple representations or diagrams, using knowledge of numbers, measures or shape and space	**HD1/E2.1** Extract information from lists, tables, simple diagrams and block graphs **HD1/E2.2** Make numerical comparisons from block graphs **HD1/E2.3** Sort and classify objects using two criteria **HD1/E2.4** Collect simple numerical information **HD1/E2.5** Represent information so that it makes sense to others (e.g. in lists, tables and diagrams)
Probability		

HD1/E3.1 Extract numerical information from lists, tables, diagrams and simple charts **HD1/E3.2** Make numerical comparisons from bar charts and pictograms **HD1/E3.3** Make observations and record numerical information using a tally **HD1/E3.4** Organise and represent information in different ways so that it makes sense to others	**HD1/L1.1** Extract and interpret information (e.g. in tables, diagrams, charts and line graphs) **HD1/L1.2** Collect, organise and represent discrete data (e.g. in tables, charts, diagrams and line graphs) **HD1/L1.3** Find the arithmetical average (mean) for a set of data **HD1/L1.4** Find the range for a set of data	**HD1/L2.1** Extract discrete and continuous data from tables, diagrams, charts and line graphs **HD1/L2.2** Collect, organise and represent discrete and continuous data in tables, charts, diagrams and line graphs **HD1/L2.3** Find the mean, median and mode, and use them as appropriate to compare two sets of data **HD1/L2.4** Find the range and use it to describe the spread within sets of data
	HD2/L1.1 Show that some events are more likely to occur than others **HD2/L1.2** Express the likelihood of an event using fractions, decimals and percentages with the probability scale of 0 to 1	**HD2/L2.1** Identify the range of possible outcomes of combined events and record the information using diagrams or tables

ENTRY LEVEL 1

At this level, adults can

read and understand information given by numbers and symbols in simple graphical, numerical and written material

specify and describe a practical problem or task using numbers and measures

generate results which make sense and use given methods and given checking procedures appropriate to the specified purpose

present and explain results which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures

Whole numbers N1/E1

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ count reliably up to 10 items – understand that if items are rearranged the number stays the same – know how to count on and back from any small number	Count children in a group to make sure no-one is missing. Count the number of screws needed for a hinge.
❶ read and write numbers up to 10, including zero – understand that numerals can be represented in different ways, e.g. Roman numerals, Arabic numerals – recognise Arabic numerals written in different fonts and styles e.g. 9, ९, 4, 4;	Select the correct numbered floor button in a lift. Write down a telephone number. Input digits using a numeric key pad (e.g. telephone, fax machine, remote control device).
❶ order and compare numbers up to 10, including zero – understand and use the vocabulary of comparing numbers, e.g. *more than, less than* – understand ordinal numbers, e.g. first, second, third	Follow directions, e.g. *Take the lift to the third floor.*
❶ add single-digit numbers with totals to 10 – understand the operation of addition and related vocabulary, e.g. *add, sum of, total, plus*, etc. – know all pairs of numbers with a total of 10 – understand that addition is commutative (the concept not the terminology)	Calculate totals, e.g. reams of paper in a full box of five plus three packs on the shelf.
❶ subtract single-digit numbers from numbers up to 10 – understand the operation of subtraction and related vocabulary, e.g. *difference, take away, less than* – know subtraction facts for pairs of numbers with totals to 10, e.g. 10 − 6 = 4 – know how to add back to check, e.g. 10 − 6 = 4, 6 + 4 = 10 – understand that subtraction is not commutative and that, using whole numbers, you can only subtract a number from itself or from a larger one – understand that subtracting zero leaves a number unchanged	Work out the shortfall in numbers, e.g. eggs for a recipe, plants to fill a display tray, cups to serve visitors, volunteers for a jumble sale.

Sample activities

- Count items, re-arrange them and count them again.
- Count on in 1p coins starting from a different number (e.g. from 3p, from 5p) up to 10.
- Write a short list in Word, e.g. a shopping list. Count the number of items and then use the automatic numbering button to check.
- Share and compare number words to 10 in different languages, and different ways of writing numerals.
- Match numbers in words and numerals.
- Practise finding numbers on different keypads, e.g. calculator, telephone, keyboard.
- Read numbers in everyday material and contexts, e.g. signs, notices, adverts, posters.
- Match ordinal and cardinal numbers.
- Write ordinal numbers next to a sequence, such as a list of instructions.
- Fill in the missing numbers in a sequence.
- Place a jumbled sequence of numbers in order.

Using games to develop numeracy

Games can help learners to practise matching, counting and computational skills such as doubling, addition, subtraction and tables. Some games combine these skills with strategy, and this can help learners to develop problem-solving skills.

Children's boards games or dominoes can be used in family numeracy sessions. Adult games include bingo, dominoes, card games, strategy games such as backgammon, and traditional African games such as *oware* and *ayo*, which are now available commercially.

Concept of number

Numbers can be thought of in different ways, e.g. as a word, a symbol, an image of a number of items, a point on a scale. It is important that the tutor establishes the learner's idea of number and works from there to develop understanding.

- Ask learners what different words they use for addition.
- Explore different strategies for mental addition by eliciting learners' methods, e.g. 5 ■ 4 is one less than 5 ■ 5.
- Use objects or coins to reinforce the idea of addition as grouping together.
- Find all the pairs of numbers with totals to 10, using coins if needed.
- Use a number line to practise addition by counting on.

- Ask learners what different words they use for subtraction.
- Explore different strategies for mental subtraction, such as counting on, 'near numbers', such as 9 − 5 is one less than 10 − 5.
- Use objects or coins to subtract all the single-digit numbers from 10.
- Compare the results of subtracting single-digit numbers from 10 with the results of adding all the pairs of numbers that make 10. Look for patterns.
- Use a number line to practise subtraction by counting back.

Using a number line

Number lines (horizontal or vertical) are helpful for some learners as a visual aid to counting on and back. At a later stage, they can be extended to negative numbers. They are a valuable tool for understanding fractions and decimals, and the concept of discrete and continuous measure.

ENTRY LEVEL 1

At this level, adults can

read and understand information given by numbers and symbols in simple graphical, numerical and written material

specify and describe a practical problem or task using numbers and measures

generate results which make sense and use given methods and given checking procedures appropriate to the specified purpose

present and explain results which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures

Whole numbers N1/E1

Skills, knowledge and understanding	Example
Adults should be taught to:	Use symbols to record whole-number calculations when solving problems.
❺ interpret ■, − and = in practical situations for solving problems – understand that ■ and − represent operations of addition and subtraction – understand = represents equality, and know related vocabulary, e.g. *equals, is equal to, is the same as*	
❻ use a calculator to check calculations using whole numbers – know the signs for addition, subtraction, equals – recognise the numerals 0–9 – understand the order to key in numbers and operators – know how to clear the display, and understand that this should be done before starting a new calculation	Any calculations at this level.

Sample activities

- Match cards with equivalent additions, e.g. 5 ⊞ 3, 5 plus 3, 3 ⊞ 5, the sum of 3 and 5, 5 add 3.
- Match cards with equivalent subtractions, e.g. 5 − 3, take 3 from 5, 5 take away 3, 5 subtract 3, the difference between 3 and 5.
- Make number sentences from cards with the numbers 0–9, and symbols ⊞, −, =.
- Identify the symbols ⊞, − and = on simple hand-held and on-screen calculators, and on computer keyboards.

- Compare simple hand-held and on-screen calculators in terms of their numerals, symbols for ⊞, − and =, and their layout.
- Use a calculator to investigate the relationship between addition and subtraction.
- Use a calculator to check any calculations at this level.

ENTRY LEVEL 2

At this level, adults can

read and understand information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe a practical problem or task using numbers, measures and simple shapes to record essential information

generate results to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Whole numbers N1/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	Count the items in a delivery.
❶ count reliably up to 20 items – count in twos and tens up to 100 – count on in tens up to 100, starting from any two-digit number	
❷ read, write, order and compare numbers up to 100 – understand that the position of a digit signifies its value – know what each digit in a two-digit number represents, including the use of zero as a place holder – recognise odd and even numbers up to 30	Choose numbers on a lottery ticket and check winning numbers. Find an address by reading door numbers. Read speed limits on traffic signs. Use page numbers to locate information.
❸ add and subtract two-digit whole numbers ❹ recall addition and subtraction facts to 10 – understand that there are different strategies to help with mental addition and subtraction – understand that subtraction is the inverse of addition – know how to align numbers for column addition	Calculate the cost in pence of two items, e.g. a newspaper and a can of drink. Calculate the difference in price in pence between two products, e.g. between two cans of drink.
❺ multiply using single-digit whole numbers – understand and use the vocabulary of multiplication, e.g. *multiplied by, times, lots of* – understand the operation of multiplication as repeated addition, e.g. 3 × 5 = 5 + 5 + 5 – understand that multiplication is commutative, e.g. 2 × 4 = 4 × 2, but that the meaning is different, e.g. take 2 tablets 4 times a day (4 × 2) is different from take 4 tablets twice a day (2 × 4) – know doubles of numbers to 10 – understand the relationship between halving and doubling	Check delivery of goods in small batches. Calculate the total number of items, e.g. three books of stamps with four stamps in each.

Sample activities

- Count the number of objects or items in a list.
- Count the value of a pile of: 10p coins, counting in tens; 2p coins counting in twos.
- Count on in tens, using 10p coins, e.g. to give change, to pay for something, to count takings for the bank, etc.
- Complete number lines to practise counting in twos or tens.
- Explore the 'Edit: Fill, Series' function on a spreadsheet, using different Start and Stop values, and Step values of two or ten.

- Write two-digit numbers as the sum of tens and units, e.g. 36 = 30 + 6.
- Match numbers in figures to numbers in words.
- Read and compare numbers in everyday material and contexts, e.g. signs, notices, adverts.
- Fill in missing numbers in a sequence and on a number line (whole, odd, even numbers).
- Look up winning lottery numbers on teletext (learners may need help with page numbers).
- Enter some simple text on a word processor and experiment with different font sizes.

- Explore strategies for adding and subtracting numbers, e.g. breaking down and recombining, looking for pairs which make 10, starting with the largest number and counting on in tens or ones, identifying near doubles.
- Match cards with subtraction facts to related addition, e.g. 12 − 9 = 3, 3 + 9 = 12.
- Break down numbers and use the knowledge of pairs which total 10 to learn pairs with totals to 20, e.g. 13 + 7 = 10 + 3 + 7 = 20.
- Apply strategies to solving problems with whole numbers.

- Discuss multiplication, using vocabulary such as *lots of*, *times*, etc., using practical examples.
- Write repeated addition sums as multiplication, and vice versa, e.g. 5 + 5 + 5 = 3 × 5; 2 × 6 = 6 + 6; match using cards.
- Extend sequences, fill in the gaps, using multiples of 2 and 10.
- Match pairs of numbers which are halves/doubles.

Strategies for mental addition

Put the larger number first and count on:
5 + 27 = 27 + 5 count on from 27

Count on in tens:
54 + 23 = 54, 64, 74 + 3

Partition numbers and recombine:
37 + 16 = 37 + 3 + 13 = 40 + 13

Use near numbers and adjust:
27 + 19 = 27 + 20 − 1 = 47 − 1

Break both numbers into tens and units:
24 + 58 = 20 + 50 + 4 + 8 = 70 + 12

Use doubles:
38 + 36 = double 40, subtract 2, subtract 4

Use combinations of these:
64 + 27 = 64 + 20 + 7 = 84 + 7 = 84 + 6 + 1 = 91

Strategies for mental subtraction

Count on from the smaller number:
23 − 18 count on from 18 to 20 and from 20 to 23

Count on in ones and tens:
83 − 58 = 58 to 60, 70, 80 to 83

Partition numbers:
98 − 43 = 98 − 40 − 3 = 58 − 3

Use near numbers and adjust:
43 − 19 = 43 − 20 + 1 = 23 + 1

ENTRY LEVEL 2

At this level, adults can

read and understand
information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and simple shapes to record essential information

generate results
to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Whole numbers N1/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	
❻ approximate by rounding to the nearest 10 – understand place value for units and tens	Round numbers to make approximate calculations.
❼ use and interpret ■, −, ● and = in practical situations for solving problems – understand that ■, − and ● represent operations	Use symbols to record whole-number calculations when solving problems.
❽ use a calculator to check calculations using whole numbers – understand the order to enter a two-digit number – understand the order to key in numbers and operators – know how to clear the display and cancel a wrong entry	Any calculations at this level.

Fractions N2/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ read, write and compare halves and quarters of quantities – know the words *half*, *quarter* and the symbols ½, ¼ – understand that two halves make one whole – understand that four quarters make one whole – understand that two quarters and one half are equivalent	Understand ½ price, half price. Know that half an hour is longer than a quarter of an hour.
❷ find halves and quarters of small numbers of items or shapes – understand the connection between *a half of* and *share* (or *divide*) *into two equal groups or parts* – understand the connection between *one quarter of* and *share* (or *divide*) *into four equal groups or parts* – know halves of even numbers to 20	Estimate equal portions of food to share with others, e.g. cut a pizza into quarters. Work out how many people to a team in a leisure activity, e.g. playing football in the park.

Number

Sample activities

- Round prices in pence to the nearest 10p.
- Perform practical tasks using measuring instruments – measure to nearest 10 cm, etc.
- Set up a spreadsheet using the ROUND function for learners to practise and self-check rounding numbers to the nearest 10 (e.g. in Excel, = ROUND(A1,-1) in cell B1 automatically rounds a number in A1 to the nearest 10; see Excel Help).

- Match words to symbols, using a range of vocabulary.
- Match word problems to written calculations.
- Translate single-step word problems into symbols and solve.

- Use a calculator to investigate the relationship between addition and multiplication, and between addition and subtraction.
- Use a calculator to check any calculations at this level.
- Compare the symbols for 'multiply' on hand-held and on-screen calculators and computer keyboards.

Sample activities

- Match words to symbols.
- Find examples of half and quarter used in everyday materials, e.g. half-price sale.
- Elicit practical examples of the use of halves and quarters, e.g. sports (pitch, half-time), measures (pint, half-pint), time (half an hour, quarter of an hour), etc.
- Relate halves and quarters to positions on a clock face.

- Investigate how many ways a piece of paper can be folded in half, e.g. a square, a rectangle.
- Match shaded fractions of shapes to fractions. (Ensure an understanding of two equal parts, rather than just two parts.) Use different shapes divided in different orientations, not just vertical divisions.
- Divide small collections of objects into halves, quarters. Discuss strategies.
- Practise using halving patterns, e.g. 64 = 32 = 16.
- Use simple graphic software (e.g. Paint) to create, divide and colour simple shapes into halves or quarters.

At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

Whole numbers N1/E3

Skills, knowledge and understanding

Adults should be taught to:

1 count, read, write, order and compare numbers up to 1000
- understand that the position of a digit signifies its value
- know what each digit in a three-digit number represents, including the use of zero as a place holder
- recognise odd and even numbers
- count on or back in 10s or 100s starting from any two-digit or three-digit number, up to 1000

2 add and subtract using three-digit whole numbers

3 recall addition and subtraction facts to 20
- understand that there are different strategies for adding and subtracting
- know how to align numbers in column addition
- understand that there are different methods of checking answers, e.g. adding in a different order, using inverses, using a calculator

4 multiply two-digit whole numbers by single-digit whole numbers

5 recall multiplication facts (e.g. multiples of 2, 3, 4, 5, 10)
- recognise two-digit and three-digit multiples of 2, 5 or 10 and three-digit multiples of 50 and 100
- understand how the distributive law can be used in multiplication (the concept, not the terminology)
- understand that there are different strategies for multiplying

Example

Recognise when house numbers go up in odd or even numbers.

Find items for an order from bin numbers.

Write a cheque.

Carry out a stock check.

Calculate the production shortfall from a daily target.

Calculate the total number of items in batches, e.g. 5 crates with 16 boxes to a crate.

Fill in the amounts on a paying-in slip.

Sample activities

- Write three-digit numbers as sums of hundreds, tens and units, e.g. 367 = 300 + 60 + 7.
- Investigation: how many numbers can be made from three given digits?
- Practise selecting pages on teletext.
- Match numbers in figures to numbers in words.
- Investigation: highlight even numbers in an electronic number square. Look for a pattern and establish a 'rule' for even numbers. Which numbers are not highlighted? Look for a pattern and establish a 'rule' for odd numbers.
- Extend number sequences; fill in the gaps.
- Place jumbled number sequences in order.

- Match cards with subtraction facts to related addition facts, e.g. 20 − 14 = 6, 6 + 14 = 20.
- Share strategies for mental addition and subtraction and for checking answers.
- Share written methods of addition and subtraction related to mental strategies and learner's own methods.
- Apply mental strategies and written methods to solving problems with whole numbers.

Strategies for mental addition and subtraction

Use the same strategies as for two-digit numbers and extend into hundreds. See page 25.

- Highlight multiples of 2, 5, 10 in turn on a number square. Look for patterns, and establish 'rules' for multiples of 2, 5, 10. Does the rule hold for three-digit numbers? Use a calculator to check.
- Use a calculator to find multiples of 50 and 100 up to 1000. Look for patterns and establish the 'rules' for multiples of 50 and 100.
- Extend sequences of multiples. Fill in the gaps.
- Share strategies for multiplication, e.g. 2 × 26 is two 25s and two 1s, or two 20s and two 6s, etc.
- Share written methods of multiplication related to mental strategies and learners' own methods.

  (See Level 1, page 35, for examples of informal methods and standard methods).

Strategies for mental multiplication

To multiply by 2, split into tens and units and double:
2 × 36 is double thirty plus double 6

To multiply by 4, double and double again:
4 × 25 is double 25 which is 50 and double again which is 100

To multiply by 5, multiply by ten and halve:
5 × 14 is half of 10 × 14 which is half of 140

To multiply by 15, multiply by 10, halve it and add the two together

Use near numbers and adjust:
3 × 19 = (3 × 20) − 3 = 60 − 3 = 57

Split numbers (use distributive law):
3 × 56 = 3 × (50 + 6) = (3 × 50) + (3 × 6) = 150 + 18

At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

Whole numbers N1/E3

Skills, knowledge and understanding

Adults should be taught to:

6 divide two-digit whole numbers by single-digit whole numbers and interpret remainders
- understand division as repeated subtraction
- understand that division is the inverse of multiplication
- understand that division is not commutative, i.e. 8 ▭ 4 is not the same as 4 ▭ 8
- understand the concept of remainder, and that remainders need to be interpreted in context when solving problems

Example

Work out the number of cars needed to transport a group of people.

7 approximate by rounding numbers less than 1000 to the nearest 10 or 100
- understand place value for units, tens, hundreds

Round numbers to make approximate calculations.

8 estimate answers to calculations
- know how to approximate numbers by rounding and use in approximate calculations
- understand that a knowledge of context enables 'guessing' at answers (e.g. *it should be about . . .*), or judging if answers are sensible (e.g. *that's far too big; it doesn't make sense to have an answer less than 1*, etc.)

Check that answers to problems are sensible.

9 use and interpret ▭, −, ▭, ▭ and ▬ in practical situations for solving problems
- understand that ▭, −, ▭, ▭ represent operations

Use symbols to record whole-number calculations when solving problems.

Sample activities

- Use objects or coins to illustrate division as repeated subtraction.
- Discuss the interpretation of remainders in the context of problems.
- Use a calculator to investigate the relationship between multiplication and division.

Strategies for mental division

To divide by 2, split and halve:
76 ÷ 2 = half of 60 and half of 16

To divide by 4, halve and halve again:
28 ÷ 4 = half of 28 which is 14 and half of 14 which is 7

Break down into factors:
90 ÷ 6 = (90 ÷ 3) ÷ 2 = 30 ÷ 2 = 15

- Underline the tens digit in a three-digit number; round to the nearest 10.
- Underline the hundreds digit in a three-digit number; round to the nearest 100.
- Round distances to the nearest 10 or 100 miles.
- Round weights to the nearest 10 or 100 grams.
- Set up a spreadsheet using the ROUND function for learners to practise and self-check rounding numbers to the nearest 100 (e.g. in Excel, = ROUND(A1,-2) in cell B1 automatically rounds a number in A1 to the nearest 100; see Excel Help).

Language in solving problems

Language can be a barrier to solving problems. Learners who can work out the answer to a simple calculation may not be able to solve a word problem that comes down to the same operation and numbers. Extracting given information, deciding what additional information is required and how to obtain it, and then knowing what to do with it, are difficult skills to teach and learn. Discussion of a wide variety of problems is essential. Present the same problem with different numbers. Present problems with the same numbers that require different operations. For each problem, encourage learners to ask: *What do I know? What do I need to know?* Encourage the use of approximation and estimation, and ways of checking answers, including: *What does my answer mean, and does it make sense?*

- Discuss the use of estimation for different purposes, e.g. checking the size of answers obtained with a calculator, getting a rough idea of cost, size, quantity, etc.
- Estimate the answers to calculations when solving problems.

- Match words to symbols, using a range of vocabulary.
- Match word problems to written calculations.
- Translate single-step word problems into symbols, and solve.

ENTRY LEVEL

At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

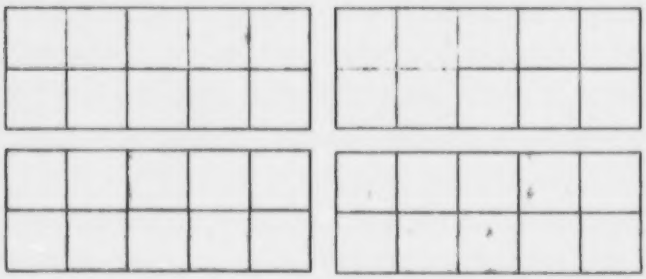
Fractions and decimals N2/E3

Skills, knowledge and understanding	Example
Adults should be taught to:	
⓱ read, write and understand common fractions (e.g. ¾, ⅔, 1/10)	Understand fractions used in sale signs and special offers, e.g. *⅓ off.*
– understand that the bottom number (denominator) indicates the number of equal parts in the whole	
– understand that a unit fraction is one part of a whole divided into equal parts	
– understand that non-unit fractions are several equal parts of a whole, indicated by the top number (numerator)	
⓲ recognise and use equivalent forms (e.g. 5/10 = ½)	In the context of measures, recognise relationships, e.g. that 5 mm is half a centimetre, 50 cm is half a metre, 500 g is half a kilo, 500 ml is half a litre.
– understand that equivalent fractions look different but have the same value	
– understand that when the top and bottom number of a fraction are the same, this is equivalent to 1	
⓳ read, write and understand decimals up to two decimal places in practical contexts (such as: common measures to one decimal place, e.g. 1.5 m; money in decimal notation, e.g. £2.37)	Read price labels written in decimal notation. Understand prices on a menu in a restaurant, hotel or café.
– understand that the decimal point separates pounds and pence, or m and cm	
– understand the use of zero as a place holder, e.g. £1.05 is £1 and 5p	
– understand the use of a leading zero, e.g. 35p = £0.35; 0.5 m = 50 cm	
– recognise .5 as a half, e.g. 2.5 m as 2½ m	
⓴ use a calculator to calculate using whole numbers and decimals to solve problems in context, and to check calculations	Any calculations at this level.
– know how to key in and interpret money calculations e.g. key in 85p as 0.85, interpret 8.2 as £8.20	
– understand that a calculator will sometimes display a string of digits after the decimal point, and that it is only necessary (at this level) to read the first two, e.g. 1.33333333 is £1.33	
– know and use strategies to check answers obtained with a calculator	

Sample activities

- Match shaded fractions of shapes to fractions. (Ensure the understanding of equal parts, rather than just parts. Use different shapes divided in different orientations, not just vertical divisions.)
- Match fractions in words and symbols.
- Read fractions used in everyday material, e.g. in newspaper headlines and reports, adverts, catalogues, etc.

Equivalent fractions



It will be obvious to most learners that one half of the first rectangle is shaded; but what about the other rectangles? Using different graphic representations can help to secure understanding of equivalent fractions.

- Circle equivalent fractions in a list, e.g. $\frac{1}{2}$, $\frac{5}{10}$, $\frac{50}{100}$.
- Investigation – look for a pattern in fractions equivalent to $\frac{1}{2}$, e.g. $\frac{2}{4}$, $\frac{3}{6}$, $\frac{4}{8}$, $\frac{5}{10}$, $\frac{10}{20}$, $\frac{50}{100}$. Write more fractions equivalent to $\frac{1}{2}$.
- Circle fractions in a list equal to 1.

- Answer questions like *How many pence in £1.60, £2.06?*, etc., to reinforce decimal notation.
- Read sums of money written in decimal notation from adverts, price lists, menus.
- Write amounts in pence using decimal notation, e.g. 45p = £0.45.
- Select coins (£1, 10p, 1p) to match sums of money in decimal notation.
- Use a metre rule to show how decimal parts of metres are written.
- Emphasise the use of zero in £1.50 but not in 1.5 m.
- Enter the same list of numbers, to one decimal place, in two columns in a spreadsheet. Format the second column to currency and compare numbers in each column.

- Compare different calculators, and identify differences.
- Discuss the benefits and pitfalls of using a calculator.
- Discuss methods of checking answers obtained using a calculator, e.g. using inverse operations, adding or multiplying in a different order, estimation.
- Provide calculator investigations to develop number and calculator skills.
- Compare the symbols for 'divide' on hand-held and on-screen calculators and computer keyboards.

Using a calculator

An electronic calculator can be used as a tool for learning, as well as for performing calculations. Using a calculator for investigations and puzzles, which can be tedious by manual computation, can stimulate interest in numbers, number patterns and relationships, and can help to develop mathematical thinking.

Learners need to be taught how to use a calculator, including constant and memory functions to calculate efficiently, and, when they are using a calculator to solve problems, they need to develop strategies for checking answers.

See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

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straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Whole numbers N1/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	
(11) read, write, order and compare numbers, including large numbers – understand that the position of a digit signifies its value – know what each digit represents in a number up to seven digits, including the use of zero as a place holder – understand the symbols for *greater than, less than*	File plans in numerical order. Read route numbers on delivery labels.
(12) recognise negative numbers in practical contexts (e.g. temperatures) – understand the words *positive* and *negative* – know that 0 °C is the temperature at which water freezes – understand that a negative temperature is below zero	Understand the storage temperature on frozen food packets.
(13) add, subtract, multiply and divide using efficient written methods	Use written methods to generate results when solving problems using whole numbers.
(14) multiply and divide whole numbers by 10 and 100 – understand place value for whole numbers and to two-decimal places	Change whole pounds to pence, and vice versa. Change whole metres to centimetres and vice versa. Change centimetres to millimetres and vice versa.

Sample activities

- Read numbers in everyday material, e.g. new car prices, house prices, cost of major construction projects, amounts of money spent on government initiatives, Lottery wins (find these on teletext or the Internet), football attendance figures, etc.
- Discuss place value; underline the digit in large numbers corresponding to millions, tens of thousands, etc.
- Order sets of numbers.
- Given a number in words, write it in digits.
- Match words and numbers.
- Choose two number cards from a pack and write two statements about the numbers, using the symbols for *greater than* and *less than*.
- Find temperatures for different part of the world (on teletext, web sites, newspapers) and describe them as above or below freezing.
- Discuss negative numbers in the context of temperature, and how they appear to increase in value as the temperature gets colder. Use a temperature gauge for a freezer or to measure the outdoor temperature as a visual aid.

Written methods of multiplication

There are different written methods of calculation. Teachers need to understand learners' own methods in order to teach standard methods successfully.

- Explain own written methods of calculation for addition, subtraction, multiplication and division.
- Practise efficient written methods in the context of solving problems, checking answers with a calculator.

Grid method

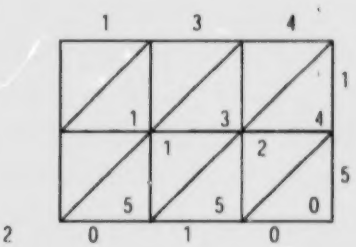
134 ■ 15

■	100	30	4	
10	1000	300	40	1340
5	500	150	20	+ 670
				2010

- Use a calculator or spreadsheet investigations to multiply whole numbers by 10, by 100, starting with single digits, two digits, etc. Deduce 'rules' from the patterns. (Beware of rules expressed as 'add a nought, add two noughts', etc. This may hide a lack of understanding of place value and lead to problems with decimals – it is better to look at the position of the digits.)
- Repeat the above for division. The inverse rule 'knock off a nought' obviously doesn't work if the number doesn't end in zero.
- For division, round numbers to the nearest 10, 100, etc. and use this to estimate the results.
- Fill in the missing operator in number sentences, e.g. 250 ? 10 = 25.

Lattice method

134 ■ 15



Standard method

134 ■ 15

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  134
■ 15
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  670
 1340
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 2010
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  11
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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

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to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Whole numbers N1/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	
❺ recall multiplication facts up to 10 × 10 and make connections with division facts ❻ recognise numerical relationships (e.g. multiples and squares) – recognise multiples of 2 to 9, up to 100 – recognise multiples of 10, 50, 100, 1000 – know square numbers up to 10 × 10	Use mental methods of multiplication and division to generate results when solving problems.
❼ work out simple ratio and direct proportion – understand simple ratio as the number of parts, e.g. *three parts to one part* – understand direct proportion as the same rate of increase or decrease, e.g. *double, half*	Dilute a liquid in a given ratio (e.g. weed killer, paint). Change quantities in a recipe to make twice as much.
❽ approximate by rounding – understand that numbers can be rounded to different degrees of accuracy, e.g. nearest 10, 100, 1000, million.	Round numbers to make approximate calculations.
❾ estimate answers to calculations – know how to make approximate calculations – understand that a knowledge of context enables 'guessing' at answers (e.g. *it should be about . . .*), or judging if answers are sensible (e.g. *that's far too big; it doesn't make sense to have an answer less than 1*, etc.)	Estimate to check that answers are reasonable.

Sample activities

- Look at strategies for dealing with larger numbers,
  e.g. 6 ◘ 7 = 2 ◘ 3 ◘ 7 = 2 ◘ 21 = 42;
  8 ◘ 9 = 8 ◘ 10 − 8 = 80 − 8 = 72.
- Use experience exchange. Learners share strategies for learning multiplication tables.
- Investigate factors, e.g. different ways of making 30 (3 ◘ 10, 6 ◘ 5). Look for patterns.
- Explain and calculate square numbers.
- Extend sequences of multiples and square numbers; fill in the gaps in sequences.
- Use the 'Edit: Fill, Series' function on a spreadsheet, using different Start, Stop values and Step values to create number patterns for other learners to identify.
- Use practical contexts to illustrate, e.g. scale quantities up (or down), using direct proportion in cooking recipes, cement mixes, etc.
- Calculate the quantities involved in diluting liquids, e.g. for soft drinks, fertiliser and weed-killer, thinning paint for sealing new plaster, etc.

Multiplication facts

These are the multiplication facts that cause most difficulty.

X	0	1	2	3	4	5	6	7	8	9	10
0	0	0	0	0	0	0	0	0	0	0	0
1	0	1	2	3	4	5	6	7	8	9	10
2	0	2	4	6	8	10	12	14	16	18	20
3	0	3	6	9	12	15	18	21	24	27	30
4	0	4	8	12	16	20	24	28	32	36	40
5	0	5	10	15	20	25	30	35	40	45	50
6	0	6	12	18	24	30	36	42	48	54	60
7	0	7	14	21	28	35	42	49	56	63	70
8	0	8	16	24	32	40	48	56	64	72	80
9	0	9	18	27	36	45	54	63	72	81	90
10	0	10	20	30	40	50	60	70	80	90	100

- Discuss the degree of accuracy in approximations, e.g. population figures, a sensible rounding of football attendance in the Premier League for reporting purposes in newspapers, compared with the needs of the financial departments of the clubs.
- Practise approximating by using everyday examples, e.g. rounding distances of local towns to the nearest 5 or 10 miles.
- Round large numbers to the nearest million, hundred thousand, ten thousand.
- Set up a spreadsheet using the ROUND function for learners to practise and self-check rounding large numbers to the nearest 1000, 10,000, million, etc. (e.g. in Excel, ▬ ROUND(A1,-6) in cell B1 automatically rounds a number in A1 to the nearest million; see Excel Help).
- Use rounding and number bonds to 10, to estimate totals, e.g. from shopping lists, bills, bank statements, etc. with the total blocked out.
- Approximate calculations: investigate the answers using different approximations. How accurate do you need to be?

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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

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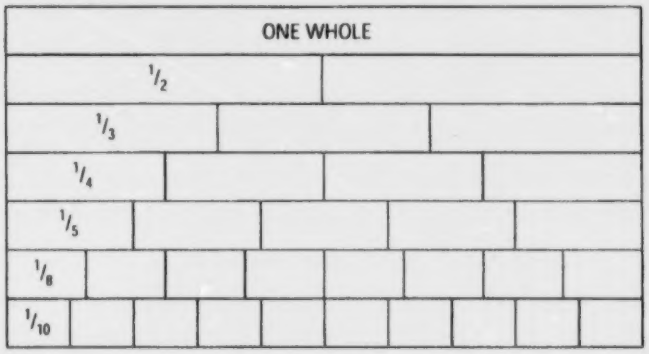
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Fractions, decimals and percentages N2/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	Read fractions used in recipes.
⑰ read, write, order and compare common fractions and mixed numbers – know common equivalent fractions, e.g. equivalent to a half, quarters, thirds, fifths, tenths – understand that in unit fractions, the larger the denominator, the smaller the fraction, but that this is not true of non-unit fractions	
⑱ find parts of whole number quantities or measurements (e.g. ⅔ or ¾) – understand the relationship between unit fractions and division when finding parts – understand that there are different strategies for finding fractional parts	Reduce the quantities in a recipe.
⑲ recognise equivalencies between common fractions, percentages and decimals (e.g. 50% = ½ , 0.25 = ¼) and use these to find part of whole-number quantities – know common fraction equivalents, e.g. half, quarters, fifths, tenths	Recognise 50% off and half-price as the same. Know ½ is 0.5 when solving a problem with a calculator.
⑳ read, write, order and compare decimals up to three decimal places – understand that the position of a digit signifies its value – know that the decimal point separates whole numbers from decimal fractions – know what each digit represents, including the use of zero as a place holder	Read and compare measurements in m and mm.
㉑ add, subtract, multiply and divide decimals up to two places – know and use strategies to check answers e.g. approximate calculations using whole numbers	Multiply prices to complete an order form. Work out wages from an hourly rate.
㉒ multiply and divide decimals by 10, 100 – understand place value for whole numbers and to two-decimal places	Change £ to pence, and vice versa. Change m to cm, and vice versa.

Fraction wall



Use 'family' walls, e.g. whole, 1/2, 1/4, 1/8; whole, 1/5, 1/10, etc. to find equivalent fractions.

Sample activities

- Use a fraction wall to compare the sizes of unit fractions, common fractions.
- Order a set of unit fractions.
- Order a set of common unit and non-unit fractions, e.g. including three-quarters, two-thirds.
- Order a set of common fractions and mixed numbers, e.g. halves, quarters, tenths including mixed numbers.
- Look at different strategies – using multiples of unit fractions (one part), combinations of unit fractions (half and quarter). Start with simple whole numbers to secure understanding of methods.
- Change the numbers of items by a fraction, e.g. adapt a plan for a buffet meal for 20, scaled down for 15 people. Recognise that $^{15}/_{20} = {}^{3}/_{4}$ and find $^{3}/_{4}$ of all the amounts (numbers of chicken legs, samosas, cakes, etc).

- Write decimals as fractions out of 100. Write percentages as fractions out of 100. Write fractions as equivalent ones out of 100.
- Use a spreadsheet to investigate the connection between percentages and decimal fractions. Enter common decimal fractions in a column. Copy the decimals into the next column and format to percent, using the % button.
- Use a calculator to investigate fractions as decimals.
- Complete a table of equivalence given a mixture of fractions, decimals and percentage values.
- Match adverts or newspaper cuttings showing the same amount, e.g. *half-price sale, 50% off!*

- Write decimals numbers as fractions, e.g. $2.45 = 2\,^{45}/_{100}$.
- Write decimal numbers as sums of fractions $2.45 = 2 + {}^{4}/_{10} + {}^{5}/_{100}$.
- Practise ordering decimals by filling in 'empty' decimal places.
- In a spreadsheet enter numbers to one, two and three decimal places. Use the 'Increase decimal' button to format the column to three decimal places, and observe changes..
- Read and order metric measurements up to three decimal places.

- Practise using numbers bonds to add decimal numbers, e.g. a column of hours worked written in whole numbers and decimal halves: 2, 1.5, 4.5, etc.
- Practise calculations with money, metric measures, data.

- Use a calculator or spreadsheet to investigate decimal numbers and record the results. Deduce 'rules' from the patterns.
- Practise converting measurements from one metric unit to another.

See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

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Fractions, decimals and percentages N2/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	Round an answer on a calculator to two decimal places.
⑦ approximate decimals by rounding to a whole number or two decimal places – know what is meant by decimal places	
⑧ read, write, order and compare simple percentages, and understand simple percentage increase and decrease – understand percentage as the number of parts in every 100 – know that 100% is the whole – understand that a 10% pay increase is more than a 5% pay increase, but the actual increase depends on the number operated on	Understand 20% off in a sale. Understand a price increase of 10%.
⑨ find simple percentage parts of quantities and measurements – understand that there are different ways of calculating percentages – understand that knowing a range of methods for use with different numbers can make life easier than a single method applied to all numbers (but the choice remains the learner's)	Calculate a down payment on goods given in percentages.
⑩ find simple percentage increase and decrease – understand that a percentage increase can be found by finding the percentage part and adding on – understand that a percentage decrease can be found by finding the percentage part and subtracting	10% rise in cost. 20% reduction in a sale.
⑪ use a calculator to calculate efficiently using whole numbers, fractions, decimals and percentages – know how to change a fraction to a decimal on a calculator – understand that percentages can be calculated in different ways, one of which is to use the function (%) key on a calculator – know how to interpret a rounding error such as 6.9999999 as 7 – know and use strategies to check answers obtained with a calculator	Any calculations at this level.

Sample activities

- Practise approximating by rounding lengths, weights, measures of capacity and money to two decimal places or whole numbers.
- Round answers on a calculator to two decimal places, to a whole number.
- Use the 'Decrease decimal' button on a spreadsheet to explore rounding decimals to whole numbers or two decimal places.

- Discuss per cent as the number of pence in the £.
- Express percentage pay increases as the number of pence in the pound.
- Write percentages as fractions out of 100.
- Discuss the meaning of percentages in everyday materials, e.g. newspaper articles, adverts, etc.
- Investigate the effects of the zoom facility, expressed in percentages, on the text display in a Word document.

- Discuss methods for finding 10% and 1%, e.g. 10p in every £, divide by 10; 1p in every £, divide by 100. Practise finding 10%.
- Discuss methods for finding 50%, 25%, 75%, e.g. pence in the £, division (and multiplication), halving and halving again (and adding), etc.
- Discuss methods for 20%, e.g. divide by 5, pence in the £, find 10% and double.
- Discuss methods for 5%, e.g. pence in the £, half of 10%.

Mental strategies for finding percentages

- To find 50%, find half
- To find 25%, find half and half again
- To find 75%, find half and half again, and add them together
- To find 10%, divide by 10
- To find 5%, find 10% and halve it
- To find 20%, find 10% and double it

- Practise with problems in context, e.g. discounts, deposits.

- Practise by applying percentage increase to simple everyday examples, e.g. wage increase, interest on savings, cost of credit.
- Practise by applying percentage decrease to simple everyday examples, e.g. working out sale price.

- Practise writing fractions as division.
- Use a calculator to change fractions to decimals using fractions as division.
- Practise fraction problems using a calculator.
- Check the results of calculations done on a calculator by different methods, e.g. rough estimates, re-input the figures in a different order, do inverse calculations.
- Look at how the % key works on different calculators. Compare the use of the % key with 'long' methods of percentage calculations.
- Look at constant and memory functions on a calculator. Discuss their uses.
- Use a calculator for any of the calculations at this level.
- Use a calculator to check answers to calculations done by other methods.

See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand
mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results
to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Whole numbers N1/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	Understand and compare government spending figures on public services.
① read, write, order and compare positive and negative numbers of any size in a practical context – understand that the position of a digit signifies its value – know what each digit in a number represents, including the use of zero as a place holder – understand the meaning of negative numbers in a practical context, e.g. temperature below zero, loss in trading	
② carry out calculations with numbers of any size using efficient methods – understand the words *multiple* and *factor* and relate them to multiplication and division facts – understand the word *prime* and know prime numbers up to 20 – know and use strategies to check answers, e.g. approximate calculations, estimation	Use mental and written methods of calculation to generate results when solving problems using whole numbers of any size.
③ calculate ratio and direct proportion – understand ratio written in the form 3:2 – understand how to work out the number of parts in a given ratio, and the value of one part	Compare the price of products of different weights or capacities.
④ evaluate expressions and make substitutions in given formulae in words and symbols to produce results – understand that words and symbols in expressions and formulae represent variable quantities (numbers), not things (i.e. 2a ■ 2b **cannot** be explained as 2 apples and 2 bananas) – understand that the contents of brackets must be worked out first – understand that, when there is no operator between a number and a variable, or two variables, multiplication is implied, e.g. 2a = 2 □ a; ab = a □ b; 2ab = 2 □ a □ b – understand that, when there is no operator between a number and a bracket, multiplication is implied, e.g. 2 (a ■ b) = 2 □ (a ■ b)	Calculate the cooking time from a given formula. Calculate areas and volumes from given formulae.

Sample activities

- Use large numbers to discuss place value, e.g. population figures, attendance at events, Lottery wins, football transfer fees, company valuations, etc.
- Discuss the meaning of negative numbers in practical contexts, e.g. national debt, third world debt, company losses, etc.
- Order the temperatures of different places on a given day (from a newspaper, web site, etc.).
- Order a set of monthly trading figures for a year, including losses.

- Discuss different methods that can be used for mental and written calculations and share short cuts and 'tricks', with explanations, e.g. break down numbers into factors.
- Use a number square and cross off multiples of numbers in turn to find prime numbers (sieve of Eratosthenes).
- Practise breaking down numbers into prime factors.
- Compare the answers to different types of calculation and use this knowledge to check the validity of the answers.
- Estimate answers to calculations when solving problems with whole numbers.

- Discuss ratio in everyday situations, e.g. in basic recipes such as pastry, dilutions as in squash, mixtures for concrete, potting composts.
- Use direct proportion in everyday situations such as scaling recipes, exchanging pounds to foreign currency.
- Calculate winnings from betting odds.
- Scale quantities up (or down), using direct proportion, e.g. in cooking recipes, cement mixes, etc.
- Calculate actual measurements from a scale drawing.

- Match expressions in words and symbols.
- Convert expressions from words to symbols, and vice versa.
- Evaluate simple expressions using a single variable, two variables, etc.
- Evaluate simple formulae using brackets, e.g. perimeter = 2 (l ■ w).
- Use formulae for area and volume.
- Use formulae for calculating miles per gallon, speed, etc.
- Use simple formulae in spreadsheets.
- Discuss simple everyday formulae such as those for cooking joints of meat, making curtains, changing temperature from Fahrenheit to Celsius, changing between metric and imperial units.

See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Fractions, decimals and percentages N2/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	Compare overtime rates.
⑪ use fractions to order and compare amounts or quantities – know how to change fractions to equivalent fractions with a common denominator	
⑫ identify equivalencies between fractions, decimals and percentages – understand that fractions, decimals and percentages are different ways of expressing the same thing – know that percentages are fractions out of 100 – know that decimal fractions are expressed in tenths, hundredths, thousandths	Write fractions of an hour as decimals on a time sheet, e.g. ¾ hour as 0.75.
⑬ evaluate one number as a fraction of another – understand equivalent fractions – understand simplest form – know how to reduce a fraction to its simplest form, e.g. by recognising equivalent fractions, by using factors to 'cancel' – recognise prime numbers (i.e. numbers that can't be cancelled) – understand that quantities must be in the same units to evaluate one as a fraction of another	Change minutes into fractions of an hour to fill in a time sheet. Represent the outcome of observations as a fraction.
⑭ use fractions to add and subtract amounts or quantities – know some common addition and subtraction facts, e.g. ½ ■ ¼ = ¾; ¾ – ½ = ¼ – understand how to change fractions to equivalent fractions for the purpose of adding and subtracting ***Note*** *Beware of teaching routines which learners attempt to copy but don't understand.*	Add hours on a time sheet that includes fractions.
⑮ order, approximate and compare decimals when solving practical problems – understand place value for whole numbers and up to three decimal places – understand that decimals can be rounded to different degrees of accuracy, depending on the purpose	Compare currency exchange rates. Round decimals to make approximate calculations. Round answers on a calculator to the appropriate degree of accuracy.

Sample activities

- Discuss ways of comparing pairs of fractions.
- Order fractions with the same denominators.
- Order fractions with different denominators.
- Order a set of common fractions and mixed numbers.

- Match fractions, decimals and percentages.
- Order a mix of fractions, decimals, percentages.
- Re-write adverts or headlines that contain fractions or percentages using an equivalent form.
- Convert fractions to decimals to enter them in a calculator.
- Use a spreadsheet to investigate the connection between percentages, decimal fractions and common fractions. Enter decimal fractions in a column and copy to the next two columns. Format one column to percentages and one to fractions (see Excel Help on formatting to fractions).

- Use examples to discuss strategies for estimating one number as a fraction of another, e.g. rounding one or both numbers up or down using their knowledge of halves, doubles, multiples.
- Discuss fractions using the attributes of the group, e.g. what fraction of the group is female, travelled by bus to the centre, etc.
- Use collected data (e.g. surveys) and describe some of the results using fractions.
- Evaluate quantities as fractions, e.g. 250 g as a fraction of a kilo.

- Use fractions of shapes to illustrate addition and subtraction, by exchanging fractions for equivalent ones, e.g. a rectangle cut into halves and quarters, swap a half for two quarters.
- Practise generating multiple patterns from different starting fractions, e.g. $^1/_3$, $^2/_6$, $^3/_9$, $^4/_{12}$, $^5/_{15}$; $^1/_4$, $^2/_8$, $^3/_{12}$, $^4/_{16}$. Illustrate the equivalence using a fraction wall.
- Identify fractions with the same denominator (bottom number) in multiple lists of pairs of fractions.
- Practise adding and subtracting simple fractions.

- Order decimal lengths, weights, capacities.
- Compare times from sprint races that are recorded in seconds to three decimal places.
- Discuss rounding answers on a calculator and the degree of accuracy that might be appropriate, e.g. calculations with money, precise measurements.
- Use the 'Decrease decimal' button on a spreadsheet to explore rounding decimals to different degrees of accuracy. Compare results with those obtained using the ROUND function.

See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Fractions, decimals and percentages N2/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	Convert sums of money between currencies.
⑯ add, subtract, multiply and divide decimals up to three places – know and use strategies to check answers, e.g. approximate calculations using whole numbers	
⑰ order and compare percentages and understand percentage increase and decrease	Calculate the total cost of an item where the price is given excluding VAT, e.g. direct sales via telephone or the Internet.
⑱ find percentage parts of quantities and measurements – understand that percentages can be worked out in different ways – know how to work out VAT – understand that the rate of VAT is set by government and is subject to change	Use interest rates to compare the cost of a loan with credit facilities.
⑲ evaluate one number as a percentage of another – understand that this may require changing a fraction to a percentage, and that it can be done in different ways	Represent the outcome of observations as a percentage.
⑳ use a calculator to calculate efficiently using whole numbers, fractions, decimals and percentages – understand the use of memory and constant functions – know and use strategies to check answers obtained with a calculator	Any calculations at this level.

Sample activities

- Discuss different methods that can be used for mental and written calculations and share short cuts and 'tricks', with explanations.
- Calculate areas and volumes using ▪ to three decimal places.
- Convert between different currencies to compare prices, e.g. work out holiday spending, etc.
- Estimate answers to calculations when solving problems with decimals.
- Search for goods on American online shopping sites and convert the prices to £ sterling.

- Discuss quick ways of finding different percentages, e.g. 10%, 5%, 20%, 25%.
- Discuss quick ways of finding 17½%. (Find 10%, halve to give 5%, halve again to give 2½% and add to get 17½%.)
- Discuss how increasing a quantity by a percentage is '100 ▪' %, e.g. increasing a price of £36 by 20% can be found by finding 120% of £36.
- Discuss how decreasing a quantity by a percentage can be found by calculating '100 −' %, e.g. reducing a price by 20% can be achieved by finding 80% of the price.
- Practise examples in context, e.g. percentage pay rises, increased or decreased mortgage payments when there is a change in interest rates, the effect of a percentage increase in the cost of fuel, etc. (household bills), adding VAT to a car service or mail order item (e.g. computer), adding 30% to prices as a profit margin in a shop. Use any methods.

- Discuss mental, written and calculator methods.
- Discuss percentages using the attributes of the group, e.g. what percentage of the group is male, travelled by bus to the centre, etc.
- Use collected data (e.g. surveys) and describe some results using percentages; approximate if necessary.
- Enter given pairs of numbers in column A and column B of a spreadsheet. Mentally evaluate the number in A as a percentage of the number in B and enter in column C. Enter a formula in column D to check the results.

- Use all the calculator functions for ▪, −, ▪, ▪▪ and % efficiently and correctly.
- Make use of the memory for simple two-stage calculations.
- Enter numbers in the correct order for expressions that include brackets.
- Use a calculator for any of the calculations at this level.
- Use a calculator to check the answers to calculations done by other methods (manual or by another person).

Calculators and rounding

When doing a calculation with several stages, learners can be tempted to round up or down half-way through, especially if the calculator comes up with numbers like 456.893021, and the learner is recording them. They need to understand that, if they round too early, they're throwing away accuracy, because the inaccuracies are compounded at each stage. The solution is to learn to use the memory button.

At this level, adults can

read and understand
information given by numbers and symbols in simple graphical, numerical and written material

specify and describe
a practical problem or task using numbers and measures

generate results
which make sense and use given methods and given checking procedures appropriate to the specified purpose

present and explain results
which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures

Common measures MSS1/E1

Skills, knowledge and understanding	Example
Adults should be taught to:	Choose the correct coins to use in a public telephone.
❶ recognise and select coins and notes – know the names and value of coins and notes	
❶ relate familiar events to: times of the day; days of the week; seasons of the year – understand and use vocabulary related to the time of day, e.g. *o'clock, midday, morning, afternoon* – understand that times are repeated in the 12-hour clock, and need to be qualified by *morning* or *afternoon* if the context is not obvious – know the days of the week and their order – know the seasons of the year and their order	Understand the day and time of class/training sessions. Understand terminology such as *spring term, summer term* in the context of the course or their children's schooling.
❶ describe size and use direct comparisons for the size of at least two items – understand and use vocabulary related to size, e.g. *large, small, larger, smaller, smallest*	Ask for items by comparative size, e.g. larger/smaller. Use judgement of size when packing or storing things.
❶ describe length, width, height, and use direct comparisons for length, width and height of items – understand and use vocabulary related to length, width and height, e.g. *long, short, wide, narrow, tall; longer, too long, longest*	Judge that a screw is too short and select a longer one, e.g. when putting up a shelf. Check a child's height against the minimum measure for a fairground ride.
❶ describe weight and use direct comparisons for the weight of items – understand and use vocabulary related to weight, e.g. *heavy, light, heavier, lighter, heaviest* – understand that weight is independent of size	Select the lighter of two items, e.g. a suitcase.
❶ describe capacity and use direct comparisons for the capacity of items – understand and use vocabulary related to capacity, e.g. *full, empty, holds more than, holds less than* – understand that capacity is a measure of volume (not just how tall or how wide) and that shapes of containers can be deceptive, e.g. broad based and narrow top	Choose a container to fill an urn with water.

Sample activities

- Use coins and notes in question–answer sessions, e.g. *Give me a 10p, Have you got a five-pound note?*, etc.
- Select from coins to match requirements in practical situations, e.g. £1 coin for a trolley, coins for a parking meter, vending machine, etc.

- In a group, discuss their daily activities and their related times, e.g. favourite TV programmes, class times, getting up, going to bed, mealtimes.
- Fill in events on a simple day plan marked in hours.
- Use the vocabulary of the different days of the week, weekday and weekend to discuss familiar events.
- Mark events on a planner for one week.
- Use TV listings to find out what days different programmes are on.
- Discuss the seasons in relation to events such as New Year, religious festivals, public holidays, education terms, etc.

- Discuss size in relation to familiar objects, or objects in the room. Give statements to describe and compare size.
- Sort similar objects in order of size.

- Compare the length, width, height of different objects.
- Discuss the size of the room, using the words *length, long, width, wide, height, high*.
- Compare the length of objects with a metre rule and decide if they are longer, shorter or the same length (learners do not have to measure at this level, but this is a useful preparatory activity).

- Compare the weight of two different sizes of the same product, to decide which is heavier, lighter, e.g. large and small bags of sugar/rice, etc.
- Compare the weights of two objects of different sizes to decide which is heavier/lighter.
- Compare objects of the same size but with different weights. Decide which is the heaviest/lightest, etc. Put them in order by weight.

- Discuss capacity, looking at common containers for liquids and solids, e.g. cartons, bottles, cans, jars, etc.
- Look at containers of different shapes which hold the same amount – check by pouring liquids from one to the other.

ENTRY LEVEL 1

At this level, adults can

read and understand information given by numbers and symbols in simple graphical, numerical and written material

specify and describe a practical problem or task using numbers and measures

generate results which make sense and use given methods and given checking procedures appropriate to the specified purpose

present and explain results which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures

Shape and space MSS2/E1

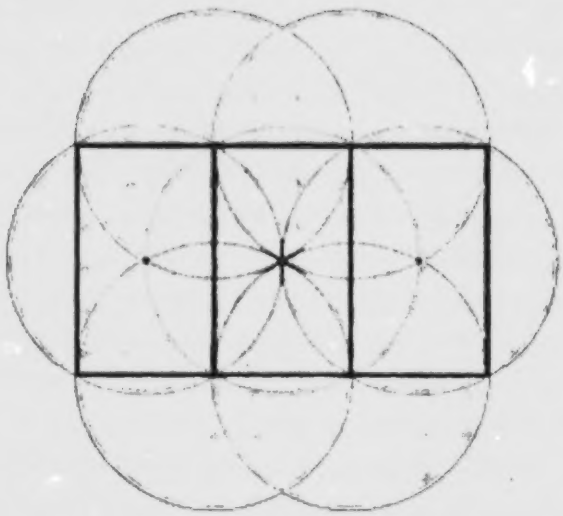
Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ recognise and name common 2-D and 3-D shapes – know the names of common 2-D shapes, e.g. *rectangle, square, circle* – know the names of common 3-D shapes, e.g. *cube* – understand that shape is independent of size – understand that shape is independent of orientation (i.e. shape is not fixed in space) and recognise shapes in different orientations – understand the difference between 2-D (e.g. flat) and 3-D (e.g. solid, or a container) shapes	Recognise the shape of traffic signs and understand that the shape has a meaning.
❷ understand everyday positional vocabulary (e.g. *between, inside* or *near to*)	Follow directions that include positional vocabulary.

Sample activities

- Identify a rectangle, square and circle from a range of 2-D shapes.
- Classify objects by shape.
- Find shapes in curtain or wallpaper designs, clothes, paintings, photographs or examples from nature.
- Compare the shape of faces of cubes and cuboids of different sizes. What is special about a cube?
- Identify a cube from a collection of objects.
- Experiment with drawing common shapes (e.g. different-sized rectangles) in a simple graphics package such as Paint.

- Follow spoken or written instructions or directions involving positional vocabulary, e.g. directions to the canteen, where to find equipment, etc. ***Note*** *This activity links to speaking and listening. See the literacy curriculum.*

Compass patterns



There are many sources of material that can be used to practise recognition of simple shapes. However, some learners may prefer practical activities. Drawing simple patterns like this one provides an opportunity to develop skills in using a compass, and can lay the foundations for understanding properties of shapes at higher levels. Alternatively, learners could use simple computer graphics programs to explore shapes and acquire some basic IT skills.

At this level, adults can

read and understand
information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and simple shapes to record essential information

generate results
to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Common measures MSS1/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	Pay the correct fare on a bus.
❶ make amounts of money up to £1 in different ways using 1p, 2p, 5p, 10p, 20p and 50p coins	Count out the exact amount when paying for something, e.g. a newspaper.
❷ calculate the cost of more than one item and the change from a transaction, in pence or in whole pounds – understand that the same strategies used with numbers can be applied in practical situations using money	Calculate the cost of two first-class stamps and the change from £1. Calculate the cost of two cinema tickets and the change from £20.
❸ read and record time in common date formats – know the months of the year in words and abbreviated forms – know the months of the year in their numbered sequence, e.g. *March is the third month* – understand the UK convention of writing the date in order of day, month, year	Understand the 'use by' date on food labels. Write their date of birth on a form.
❹ read and understand time displayed on analogue and 12-hour digital clocks in hours, half hours and quarter hours – understand that analogue clock faces can be marked in different ways, e.g. Arabic or Roman numerals, dots, lines – understand *quarter past, half past, quarter to* and know the corresponding position of the hands on the clock face – understand that the digital clock shows hours and minutes and know that *:15* on a digital clock is *quarter past, :30* is *half past, :45* is *quarter to*	Set an alarm clock. Tell the time on an analogue clock and on a digital clock (within the limits of this level).
❺ read, estimate, measure and compare length using common standard and non-standard units (e.g. metre, centimetre, paces) – understand that non-standard units are not agreed measures and can therefore vary – understand that standard measures are fixed – know that metres and centimetres are metric units of length, and have an idea of their size relative to familiar things – recognise and write *metre* and *centimetre* in full and abbreviated to *m, cm* – know that 1 m = 100 cm – understand m and cm divisions on simple scales – know how to use a ruler to draw and measure lines to the nearest centimetre	Understand measurements on labels on clothes. Measure a room to the nearest metre.

Sample activities

- Exchange coins for their equivalent value using a number of smaller coins (up to £1).
- Find the total of a selection of mixed coins.
- Pay for things by 'adding on' coins.
- Make up different given amounts using a selection of coins.
- Use everyday situations to calculate totals and change from different amounts, e.g. two items from the canteen, two bus fares, etc. Encourage a range of mental strategies (see addition, subtraction, multiplication).

- Compare today's date written in different media publications, e.g. newspapers, teletext.
- Match the months in words to their abbreviations.
- Write key personal dates, e.g. their date of birth, the dates of birth of family members.
- Match dates written in different formats, e.g. 6/3/00, 6 March 2000, 6 Mar 00, 06/03/00.
- Compare and discuss different ways of writing 'sell by' and 'use by' dates on food labels or pharmaceutical products.
- Select 'Insert: Date and Time' on Word and compare the different ways of writing today's date.
- Read the time on different analogue clock faces, using *o'clock, half past, quarter to* and *quarter past*.
- Read the time on different 12-hour digital clocks, using the vocabulary of *o'clock, fifteen, thirty,* and *forty-five*.
- Match times in words to clocks with different faces.

- Measure the length and width of the room in paces. Record and compare results, and discuss the need for standard measures.
- Use a 1-metre rule, marked in centimetres to show that 100 cm is equivalent to 1 m.
- In a group, discuss the best unit (m, cm) for measuring various items, e.g. furniture, doors, windows. Match a list of items to the best unit.
- Measure items above to the nearest m, cm, 10 cm, as appropriate.
- Estimate and then use a ruler to measure to the nearest cm lines drawn on plain paper.
- In Word, make sure that the graphics (or drawing) toolbar is displayed. In 'Draw: Grid' select the following settings: 'Snap objects to grid' – change horizontal and vertical settings to 1 cm; 'Display gridlines on screen', vertical and horizontal every 1 cm. Learners can now use the gridlines to experiment with drawing lines of different lengths. Alternatively, load a file of drawn lines for learners to measure using the grid.

ENTRY LEVEL 2

At this level, adults can

read and understand information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe a practical problem or task using numbers, measures and simple shapes to record essential information

generate results to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Common measures MSS1/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	
6 read, estimate, measure and compare weight using common standard units (e.g. kilogram) – know that a kilogram is a metric unit of weight and have an idea of the weight relative to familiar quantities, e.g. items of food – recognise and write *kilogram* in full and abbreviated to *kilo* and *kg* – understand kilogram divisions on a simple scale	Weigh themselves to the nearest kilo.
7 read, estimate, measure and compare capacity using common standard and non-standard units (e.g. litre, cupful) – understand that non-standard units are not agreed measures and can therefore vary – understand that standard measures are fixed – know that a litre is a metric unit, and have an idea of the amount relative to familiar quantities (e.g. such as cartons or bottles of milk and other drinks) and to non-standard measures, e.g. more than a cup – recognise and write *litre* in full and abbreviated to *l* – understand litre divisions on a simple scale	Use non-standard measures in cooking (e.g. tablespoonful or cupful). Read the capacity of paint tins to buy a required amount.
8 read and compare positive temperatures in everyday situations such as weather charts – understand that temperature is a measure of heat (or cold) – understand that weather temperature is measured in degrees Celsius in the UK (but that different scales exist)	Decide what to wear from the temperature given on the weather forecast.
9 read simple scales to the nearest labelled division – understand that scales measure in different units – understand labelled divisions on different scales	Read a speedometer to the nearest 10 mph.

Sample activities

- Use a kilogram weight (e.g. bag of sugar) to compare other weights. Use comparisons such as *more than a kilogram, less than a kilogram, about twice as much,* etc.
- Use a simple balance to weigh objects using kilogram weights.
- Estimate the weights of different objects or items (e.g. packaged foods, washing powder) to the nearest kilo, and check by measuring or reading the label.

- Estimate the number of glasses of water to fill a litre jug or bottle and check by measuring.
- Compare different-shaped containers that hold a litre, including a 10 cm cube.
- Use different-sized drinks bottles and cans with the labels covered to judge capacities from ½ litre to 5 litres. Record the results and check by measuring, or against the label.

- Look at weather charts in the newspaper, on web sites, and discuss the temperature, e.g. *hot, warm, cool,* etc.
- Compare the temperatures in different places on weather charts, e.g. *London is warmer than Edinburgh,* etc.
- Compare temperatures in degrees Celsius at different destinations from holiday brochures.

- Use diagrams of simple scales to be read to the nearest labelled division (identify what scales learners are familiar with through work or leisure activities).
- Make sure that the Ruler is displayed in Word ('View: Ruler'), and that measurements are set to cm ('Tools: Options (or Preferences), General'). Show learners how to enter different Top, Bottom, Left and Right margins in 'File: Page Setup'. Observe effects on text layout and look at measurements on ruler.

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ENTRY LEVEL 2

At this level, adults can

read and understand
information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and simple shapes to record essential information

generate results
to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Shape and space MSS2/E2

Skills, knowledge and understanding

Adults should be taught to:

Example

❶ recognise and name 2-D and 3-D shapes

- know the names of 2-D shapes, e.g. *rectangle, square, circle, triangle*
- know the names of 3-D shapes, e.g. *pyramid, cylinder*
- understand that shape is independent of size and orientation

Understand references to the shape of signs in the Highway Code.

❷ describe the properties of common 2-D and 3-D shapes

- describe the properties of common 2-D shapes, such as the number of sides and corners
- describe the properties of common 3-D shapes, such as the shape of faces, and the number of faces, edges and corners

Describe different tiles in terms of their properties.

Describe different containers in terms of their properties.

❸ use positional vocabulary

- understand and use positional vocabulary, e.g. *on the left, on the right, above, below, behind*, etc.

Give directions using positional vocabulary.

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Sample activities

- Identify everyday items by shape.
- Match names to shapes, and identify whether they are 2-D or 3-D.
- Find shapes in curtain or wallpaper designs, clothes, paintings, photographs, buildings or examples from nature.
- Experiment with drawing common shapes in a simple graphics package such as Paint.

- Complete a table for common 2-D shapes for the number of sides and the number of corners. Compare results. Discuss the results for a circle.
- Complete a table for common 3-D shapes for the numbers of faces, edges, corners. Compare results. Discuss the results for a cylinder.
- Describe the shape of faces of common 3-D shapes.

- Use simple (local) street plans to practise giving and following directions.
- Look at a web site such as streetmap.co.uk, and enter your own postcode to find a local map. Describe where you live in relation to a main road or a landmark such as a school, station, hospital, park. If the location has an aerial photograph, point out landmarks that you can identify.

Highway Code signs

The shape of road signs in the highway code conveys meaning. A triangle indicates a warning, a circle indicates an instruction, and a rectangle indicates information.

Warning signs

Signs giving orders

Information signs

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At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

Common measures MSS1/E3

Skills, knowledge and understanding	Example
Adults should be taught to:	
E1 add and subtract sums of money using decimal notation – know how to align decimal points and figures in column addition and subtraction – know how to enter sums of money in a calculator	Find the total cost of items. Check a till receipt. Check a bank statement. Check deductions on a pay slip.
E2 round sums of money to the nearest £ and 10p and make approximate calculations – recognise when to round up to the nearest £, e.g. £1.99 is approximately £2	Use approximate calculations to estimate the cost of shopping.
E3 read, measure and record time – understand and use *a.m.* and *p.m.* – understand and use common date formats – know how to use a calendar – read analogue and 12-hour digital clocks to the nearest five minutes	Understand programme times in listings, e.g. for television, radio, cinema. Enter an appointment on a calendar.
E4 read and interpret distance in everyday situations – know the units used for measuring longer distances, e.g. kilometres, miles – have an idea of distance in miles, e.g. know what is in walking distance when following directions	Understand a distance on a road sign when travelling by car or bus.
E5 read, estimate, measure and compare length using non-standard and standard units* – read scales to the nearest labelled or unlabelled division – know that 10 mm = 1 cm; 1000 mm = 1 m	Measure a window for a curtain or a blind. Check depth markings at a swimming pool.

**As imperial units are phased out, understanding of imperial units should be developed according to need.*

BEST COPY AVAILABLE

Sample activities

- Enter sums of money into a column in a spreadsheet and format to currency (make sure the software is set to UK), and see how the figures are aligned.
- Write sums of money in columns for addition.
- Practise addition and subtraction using shopping receipts, household bills, price lists, orders for work, pay slips, etc.
- Cost a small job of work, or work out a budget for the week's spending, using a calculator or spreadsheet.
- Check bank statements, using preferred method.

- Look at price lists, etc. and discuss why so many prices end in 95p or 99p. Write the prices to the nearest £.
- Access an online shopping site, and decide what items you would like to buy. Round prices to the nearest £ and estimate the total cost.
- Use rounding to work out the approximate cost of items in a shopping basket.

- Use a standard calendar to find different days or dates, e.g. *What is the date of the first Saturday in June? What day is May Day this year?* etc.
- Set analogue and digital clocks to various times.
- Match the times on illustrations of analogue and digital clocks.
- Match times in words to clock faces.
- Look at the date and time settings on the computer.

- Discuss the distance from home to work or home to the training centre, etc. Discuss how 'long distance' is measured, e.g. reference to signposts in the UK (miles), and signposts in other countries (kilometres).
- Discuss how far they walk to the shops, work, bus stop, etc. and how long it takes. How far would they walk in 15 minutes or half an hour? When would they walk or cycle or catch a bus?
- Provide distances in miles from where you are to nearby places, e.g. towns and cities in the UK. Rank them in order of distance from the local centre.

- Suggest appropriate units to measure, for example, a football pitch, the distance to Birmingham, the length of a curtain, the height of a door, the length of a nail, etc. (Select lengths that are within the learner's experience and relevant to it.)
- Practise estimating, measuring and recording lengths in different units, using different measuring instruments.
- Order lengths in metres in decimal notation. Use a rule or tape to measure out lengths and check the results.
- Use a ruler marked in millimetres and labelled in centimetres to draw and measure lines of different lengths.

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At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

Common measures MSS1/E3

Skills, knowledge and understanding	Example
Adults should be taught to:	
⑥ read, estimate, measure and compare weight using non-standard and standard units* – read scales to the nearest labelled or unlabelled division – know that 1000 g = 1 kg	Weigh ingredients for a recipe. Select packaged goods by weight. Weigh a letter or parcel to work out the postage rate.
⑦ read, estimate, measure and compare capacity using non-standard and standard units* – read scales to the nearest labelled or unlabelled division – know that 1000 ml = 1 litre	Measure milk for use in a recipe. Mix a baby's bottle feed according to instructions.
⑧ choose and use appropriate units and measuring instruments – know metric units of length, weight and capacity – know which instrument is appropriate for measuring length, weight and capacity of differing magnitude	Choose and use a 5 m tape to measure the dimensions of a room.
⑨ read, measure and compare temperature using common units and instruments – know how to read a thermometer – understand that temperature can be measured on different scales, but that Celsius is the standard scale in the UK	Take own temperature. Set the oven temperature for cooking.

Shape and space MSS2/E3

Skills, knowledge and understanding	Example
Adults should be taught to:	
⑩ sort 2-D and 3-D shapes to solve practical problems using properties (e.g. lines of symmetry, side length, angles) – understand and use vocabulary related to shape, e.g. *side length, angle, line of symmetry* – identify right angles in 2-D shapes and in the environment – recognise that a straight line is equivalent to two right angles	Pack items into a delivery van. Fill shelves with packaged items.

**As imperial units are phased out, understanding of imperial units should be developed according to need.*

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Sample activities

- Collect labels from different packaging (e.g. food and household items) and compare the weights.
- Practise estimating, measuring and recording weights in different units, using different instruments.
- Match familiar items to given weights, e.g. a packet of crisps, a tin of beans, a bag of rice; 30 g, 415 g, 3 kg. (Make sure that there is sufficient difference in the weights.)

- Collect labels from different bottles, drink cartons, etc. showing capacity in ml or litres.
- Estimate and check the capacity of different containers for different purposes, using measuring jugs and other containers of known capacity, e.g. *Can I get a litre of milk in this jug? Can I mix 5 litres of weed-killer in this watering can? Can I use this saucepan to make 2 litres of soup?*
- Match items to given measures, e.g. a spoonful of medicine, a can of drink, a large bottle of drink, 5 ml, 330 ml, 2 l. (Make sure there is sufficient difference in the capacities.)

- Choose the appropriate instrument from a selection provided to match a variety of measuring tasks, e.g. tape measure, ruler, kitchen scales, letter scales, bathroom scales, measuring jugs, spoons, medicine cap, etc.
- Look at the different units used in Word (e.g. font size in points, margins in cm). Look at the options available in 'Tools: Options (or Preferences), General' and experiment with different units.

- Compare thermometers used for different purposes – clinical thermometers and fever scans for body temperature, weather thermometers, thermometers used in cooking, etc.
- Practise reading scales on different thermometers (using diagrams if necessary).
- Look at oven temperatures in different recipes. Decide what is a hot oven or a cool oven.
- Use teletext or a web site to find and compare today's temperatures in different cities around the world.

Sample activities

- Identify right angles on everyday items, e.g. table, shelves, paper, bricks.
- Sort 2-D shapes into those with right angles and those without.
- Sort 3-D shapes into those with right angles and those without.
- Use paper cut-outs of regular shapes to find lines of symmetry by folding.
- Sort 2-D shapes according to the number of sides, number of angles, number of equal sides, number of equal angles, number of lines of symmetry.
- Sketch the lines of symmetry in shapes and images.
- Investigate ways of stacking 3-D shapes of the same size on a shelf and for a display, e.g. cylinders (cans), cuboids (boxes).

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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

read and understand
straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Common measures MSS1/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ add, subtract, multiply and divide sums of money and record – understand place value of whole numbers and decimals – know that, for column addition and subtraction, decimals should be aligned by the decimal point	Fill in an expenses claim. Calculate benefits or entitlements. Check pay and deductions on a payslip. Work out the cost of goods on credit from repayments.
❷ read, measure and record time in common date formats and in the 12-hour and 24-hour clock – understand and use common date formats – understand time in the 12-hour and 24-hour clock – know that midnight is 00:00, or 0000, and 12:00 or 1200 is midday – understand and use timetables – know the units of time: *millennium, century, year, month, week, day, hour, minute, second*	Use timetables. Find travel information and schedules on the Internet. Plan an event.
❸ calculate using time – know the relationship between units of time, e.g. 1 hour = 60 min – add and subtract times in hours and minutes – convert units of time, e.g. 70 minutes is 1 hour 10 minutes	Calculate a journey time from a timetable. Fill in a time sheet.
❹ read, estimate, measure and compare length, weight, capacity and temperature using common units and instruments – know the standard metric units of length, weight and capacity including abbreviations *(km, m, cm, mm, kg, g, l, ml)* – read scales to the nearest labelled and unlabelled division	Check the temperature in the workplace against regulations.

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Sample activities

- Price a list of items from a mail order catalogue and calculate the total cost.
- Select items that can be bought within a given price range or budget.
- Work out the cost of taking a family or a group of people on a bus or train journey, a visit to the cinema or some other outing or excursion.
- Work out the total cost of an item bought using a credit agreement or loan, from the weekly or monthly repayments.
- Organise a 'coffee club' (or similar) within the group and work out what they need to buy and how much to collect from each person.
- Use a spreadsheet to work out a personal or holiday budget. Experiment with changes to stay within budget.
- Use a spreadsheet to record expenditure.

- Identify the uses of different units of time, e.g. seconds (timings on a microwave oven, sprints in athletics, different processes in a factory, etc.), minutes (boiling an egg and other cooking times, times of trains and buses, lengths of TV programmes and films, etc.), and hours (working day, car journeys, flights, etc.).
- Use stopwatches, ordinary watches, clocks and calendars to measure, record and compare the time taken to complete different activities.
- Discuss the difference between the 12-hour and 24-hour clock and the different notation for recording time.
- Match 12- and 24-hour clock times.
- Use bus or train timetables to answer questions such as *What time must I leave Cambridge to arrive in London by 10.00?, What time is the last bus home from town?*, etc.
- Convert flight departure times in holiday brochures to everyday descriptions, such as *half past 10 at night*.
- Practise accessing online rail timetables for different dates and departure or arrival times.

- Work out the length of a working day or job, from the start and finish times recorded on timesheets or clock cards (including breaks).
- Work out the number of hours worked in a week.
- Use bus and rail timetables to calculate journey times from departure and arrival times.
- Calculate the duration of different activities, e.g. radio or TV programme, film, flight.

- Choose units and instruments for different measuring tasks. Estimate, then measure and read scales to the nearest labelled or unlabelled division.
- Discuss the different systems used for measurements – metric and imperial units. Produce a list of the different units in use for weight, length and capacity, with approximate equivalences, e.g. *a litre is a bit less than 2 pints, a kilo is just over 2 pounds, a yard is a bit less than a metre*, etc.
- Compare temperatures in degrees Celsius and degrees Fahrenheit, using everyday sources where both are given, e.g. recipe books, oven manuals, holiday brochures.
- Discuss how temperature is important in some aspects of life and work, e.g. safe temperatures for frozen foods and settings for domestic freezers, storing chemicals at the right temperature, etc.

BEST COPY AVAILABLE

See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

read and understand
straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Common measures MSS1/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	
❺ read, estimate, measure and compare distance – know that distance is measured in miles or kilometres – understand and use a mileage chart – know how to use a simple scale to estimate distance on a road map	Find the distance between two cities using a road map or mileage chart.
❻ add and subtract common units of measure within the same system – know the relationship between metric units	Work out the length of cabling needed along a particular route, e.g. for a telephone extension. Work out personal weight gain or loss over a period of time.
❼ convert units of measure in the same system – know the relationship between metric units	Compare the dimensions of furniture or appliances given in cm and mm. Convert measurements to the same units to work out an area.
❽ work out the perimeter of simple shapes – know that perimeter is the boundary of a shape – know that perimeter is measured in units of length – understand that the measurements required to calculate the length of the perimeter depend on the shape	Work out the fencing required for a vegetable plot.
❾ work out the area of rectangles – know that area is a measure of surface – know what measurements are required to calculate area, and how to obtain them – know that measurements must be in the same units before calculating area – know that the area of a rectangle = length × width – know that area is measured in square units	Work out the floor area of a rectangular room. Work out the area of lawn to calculate how much grass seed is needed.

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Sample activities

- In discussion, estimate the distances between different towns and cities. Look at the distances on a road map and use the mileage chart in a road atlas to find the actual distances.
- Use mileage charts to find the distances between different towns and cities.
- Find a local map on line (e.g. www.streetmap.co.uk and enter postcode) and use the scale to estimate the distance from home to a landmark such as a station, hospital, school, etc.
- Work out the total distances for delivery vans, district nurse, health visitor, etc. from a list of calls, using a local map, or mileage chart.

- Calculate totals in practical situations, e.g. material for a curtain (window height plus hem).
- Work out how much is left from a length of timber, pipe, material, etc. after cutting off a given amount.
- Work out how much would be left in a container of liquid after removing a given amount.
- Work out how much is left after using a given weight.

- Convert measurements of length from one metric unit to another, e.g. mm to cm, cm to m and vice versa.
- Convert measurements of weight from one metric unit to another, e.g. kg to g and vice versa.
- Convert measurements of capacity from one metric unit to another, e.g. l to ml and vice versa.
- Use a table for common imperial measures for weight, length and capacity to convert between pounds and ounces, feet, inches and yards, pints and gallons in practical situations.

- Discuss the meaning of perimeter and its use in practical contexts.
- Find the perimeter of shapes in different ways, e.g.: for large shapes such as a room or garden use pacing, a trundle wheel, metre stick or measuring tape; for smaller shapes use a piece of string, a 30 cm or metre rule.
- Discuss ways of finding the perimeter of a rectangular shape – by measuring two sides – and derive a simple formula in words. Use the formula to check the perimeters of some of the shapes that have been found previously.
- Investigate simple shapes (rectangles, squares) with the same perimeter.

- Discuss reasons for finding areas, e.g. for items that are sold by the square metre or square yard (such as carpets), to estimate the amount of paint required to paint a wall (coverage is given on the tin).
- Discuss the units of measure for area, e.g. square centimetre, square metre, square yard and the different ways to write them, e.g. cm^2. Decide which units are appropriate for different-sized areas.
- Look at different ways of finding areas – by counting squares on drawings on squared paper, by drawing a plan and drawing in squares to scale.
- Find areas of different rectangular shapes and from the results construct a formula in words to find the area of a rectangle.
- Estimate, measure and calculate areas of different rectangular shapes, e.g. walls, table tops, floor areas, etc.

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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

LEVEL 1

At this level, adults can

read and understand
straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Common measures MSS1/L1

Skills, knowledge and understanding

Adults should be taught to:

10 work out simple volume (e.g. cuboids)
- know that volume is a measure of space
- know what measurements are required to calculate volume, and how to obtain them
- know that measurements must be in the same units before calculating volume
- know that the volume of a cuboid = length × width × height (or depth)
- know that volume is measured in cubic units

Example

Work out the volume of soil needed to fill a rectangular planter.

Shape and space MSS2/L1

Skills, knowledge and understanding

Adults should be taught to:

11 solve problems using the mathematical properties of regular 2-D shapes (e.g. tessellation or symmetry)
- know that angles are measured in degrees
- know that a right angle is 90° or a quarter-turn
- know that four right angles fill a space
- identify regular shapes

Example

Select tiles for a floor or wall.

12 draw 2-D shapes in different orientations using grids (e.g. in diagrams or plans)
- know the properties of regular 2-D shapes

Draw a tiling pattern for a floor or wall area.

Draw a floor plan to show a room layout.

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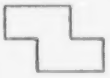
Sample activities

- Discuss what volume means, how it is used, what units are used and how they are written (include words like *cube, cubic,* etc).
- Work out the volume of a box by seeing how many cubes will fit.
- Use the formula for finding area to construct a formula for finding volume.
- Work out the volume for simple cuboid shapes, such as boxes.
- Calculate volumes from given dimensions in practical tasks, e.g. volume of concrete, soil.

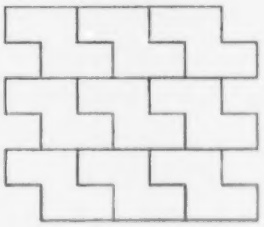
Sample activities

- Investigate which regular shapes will tessellate (i.e. fit together without a gap).
- Plan a tiling pattern using rectangular tiles of the same size.
- Plan a tiling pattern using two sizes of square tiles.
- Plan a tiling pattern using square tiles with a symmetrical pattern.
- Plan their own tiling pattern using any shape, or combination of shapes.
- Use the properties of regular shapes in solving perimeter problems.
- Use a graphics package (or 'Draw' in Word) to create tessellations using a single shape and transformations (copy and paste the shape and flip or rotate).
- Use pinboards, isometric and squared paper to help.
- Draw simple plans.
- Use a graphics package (or 'Draw' in Word with gridlines displayed and set to 'Snap to grid') to draw 2-D shapes.

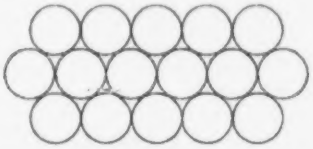
Tessellations



This shape tessellates – it leaves no gaps.



Investigate other shapes made up of four squares. Investigate pentagons, hexagons, octogons.



Circles don't tessellate – they leave gaps.

Islamic art and the art of M.C. Escher provide interesting stimulus material that can be used to discuss and identify tessellations.

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See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Common measures MSS1/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	
⑲ calculate with sums of money and convert between currencies – understand that exchange rates of currencies are not fixed, but vary on a daily basis – understand buying rate and selling rate	Calculate the price in sterling of an item quoted in dollars (e.g. prices on web sites). Calculate the price of an item or service when on holiday abroad, e.g. a meal, car hire, water sports, boat trip, etc. Calculate the value of currency brought back from holiday.
⑳ calculate, measure and record time in different formats – understand dates and times written in different formats – know how to use measuring instruments, e.g. timers on appliances, clocks, watches, etc. – know the relationship between units of time, e.g. sec, min, hr, day, week, month, year	Measure and record the down time of a machine. Plan an event. Calculate cooking time according to weight, e.g. for a turkey.
㉑ estimate, measure and compare length, distance, weight and capacity using metric and, where appropriate, imperial units – know the metric units of length, distance, weight, capacity – know the common imperial units of length, distance, weight, capacity, where appropriate, e.g. *yard, feet, inches, miles, tons, pounds, ounces, pints, gallons* – read scales to different levels of accuracy, including reading between marked divisions	Compare the nutritional information on different food labels. Check the calibrations on a machine.
㉒ estimate, measure and compare temperature, including reading scales and conversion tables – know how to read a thermometer – know that temperature can be measured on Celsius and Fahrenheit scales	Adjust the temperature on a central heating system. Check the temperature on a freezer against safety regulations.

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Sample activities

- Use information from newspapers, banks, the Internet, etc. to find the value of £1 in different currencies. Discuss how these vary from day to day.
- Given exchange rates for £1 for a selection of countries/currencies, calculate the equivalent amount for different sums, e.g. £10, £50, £100, £200.
- Investigate the difference between the buying rate and the selling rate for different currencies and discuss the implications.
- Use approximation to calculate the cost of goods in £ to compare prices in different currencies.
- Use the Euro to compare the cost of goods in different countries.
- Look at on-line shopping sites, hotels or flight prices, etc. that use different currencies on the Internet and convert the prices to £, using any relevant method.
- Use a calculator to convert between currencies and check the calculation using a written or mental approximation.
- Use bank buying rates to convert amounts in different currencies brought back from a holiday into £ again, e.g. 3000 pts, $50, etc.

- Use the Internet to look at information on web sites in different countries to see how the date is written.
- Use a calendar to calculate the length of time between given dates, e.g. term dates, holiday dates.
- Calculate the return date from a given departure date (for holidays) for different time spans, e.g. 7 days, 10 days, 14 days.
- Calculate journey times from timetables.

- Discuss the appropriate units of measure for length, distance, weight, capacity, and the use of metric and imperial units.
- Suggest the appropriate units of measure for different given situations, e.g. distance in the UK, distance in other European countries, lengths of different races (short sprints, middle distance, long distance and marathons), weights of groceries, cars, etc.
- Estimate and check distances between towns, cities in the UK and further afield, using signposts, distance charts in road atlases, estimation from known distances on maps, etc.
- Undertake measuring tasks to varying degrees of accuracy using appropriate instruments.

- Check the storage temperatures for refrigerators and freezer compartments, converting between Celsius and Fahrenheit if necessary, and deciding on safe storage temperatures for different types of food.
- Check Health and Safety regulations for working temperatures.
- Look at oven temperatures for different recipes; convert between Celsius and Fahrenheit and estimate values for cool, medium and hot ovens in both systems.
- Be able to read and record the temperature accurately from a variety of different devices, both analogue and digital, and recognise whether they are in Fahrenheit or Celsius from the device or the situation.

BEST COPY AVAILABLE

See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Common measures MSS1/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	Work out the best value of products of different weights or capacities.
⑮ calculate with units of measure within the same system – know the relationship between metric units – know the relationship between common imperial units, where appropriate	
⑯ calculate with units of measure between systems, using conversion tables and scales, and approximate conversion factors – know rough equivalences between common metric and imperial measures, e.g. *1 lb is about 450 grams, a litre is a bit less than 2 pints, a gallon is about 4½ litres, a kilogram is a bit more than 2 lb, a metre is a bit more than a yard, an inch is about 2½ cm, a foot is about 30 cm* – know how to read conversion scales and tables – know how to use approximate conversion factors, e.g. 1 inch = 2.54 cm	Convert litres to gallons to check the petrol consumption on an old vehicle, or to compare it with a new vehicle.
⑰ understand and use given formulae for finding perimeters and areas of regular shapes (e.g. rectangular and circular surfaces) – know what is meant by perimeter, circumference, diameter, radius – recognise the symbol for *pi*, and know its approximate value – know how to make substitutions in a formula and work out the result	Calculate the length of fencing needed to fence off a circular pond.

BEST COPY AVAILABLE

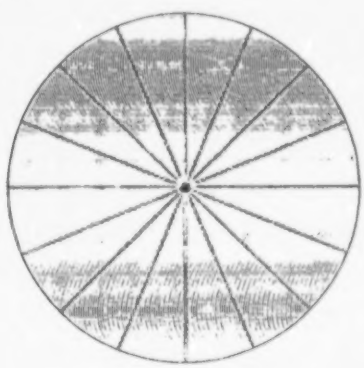
Sample activities

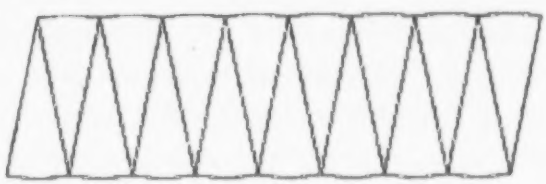
- Calculate the amount of paint required from the area of wall to be painted.
- Calculate the number of shelves of a given length that could be cut from a length of timber.
- Calculate the total area of carpet needed for a room and use the information to calculate the total cost from the cost per square metre.

- Use conversion tables to convert weights, lengths, capacities using any relevant measures, e.g.: capacities on milk bottles, tanks, containers; weights of vehicles, groceries, babies, adults; dimensions of timber, sports pitches, etc.
- Construct a conversion chart or line graph to convert miles to kilometres, and use it to convert between the two, using distances between towns, etc.
- Check the use of tables by using given approximate conversion factors.
- Match rough equivalences between metric and imperial units.

mArea of a circle

- Find the number of times the diameter of a circle fits around the circumference, using string and a dustbin lid, thread and a plate, etc. Compare the results from measuring several different objects to agree an approximation.
- Use the results of the investigation to work out a simple formula for the circumference of a circle and check the results of using the formula.
- Practise using given formulae to find the circumference of circles, and other regular shapes.
- Use illustrations of a circle divided into equal slices, with slices re-arranged to approximate a rectangle. Discuss the length of the sides of the rectangle to derive the formula for area.
- Practise using given formulae to find the area of circles, and other regular shapes.
- Set up a spreadsheet to investigate the area of different rectangles with the same perimeter. Which rectangles have the largest/smallest area?





area = $\pi r \times r = \pi r^2$

The more equal sectors ('slices') there are in the circle, the closer the rearrangement becomes to a rectangle, of length πr (half the circumference), and width r (radius)

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See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
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present and explain results clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Common measures MSS1/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	
⑱ understand and use given formulae for finding areas of composite shapes (e.g. non-rectangular rooms or plots of land) – know that measurements must be in the same units before calculating area – know how to break down a composite shape into regular shapes	Calculate the wall area for painting, excluding doors and windows.
⑲ understand and use given formulae for finding volumes of regular shapes (e.g. a cuboid or cylinder) – know that measurements must be in the same units before calculating volume – recognise the symbol for *pi*, and know its approximate value – know how to make substitutions in a formula and work out the result	Work out the volume of soil required for a cylindrical tub.
⑩ work out dimensions from scale drawings (e.g. 1:20) – understand scale written as a ratio – understand that, when expressed as a ratio, the scale is independent of units	Calculate the actual cutting lengths from a scale drawing. Work out distances from the scale on a map.

Shape and space MSS2/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	
⑪ recognise and use common 2-D representations of 3-D objects (e.g. in maps and plans) – understand that 3-D objects can be represented in 2-D	Set a machine from information on drawings.
⑫ solve problems involving 2-D shapes and parallel lines (e.g. in laying down carpet tiles) – understand the meaning of *parallel*, and recognise parallel lines	Arrange a cutting pattern on material so as to minimise wastage. Lay floor tiles.

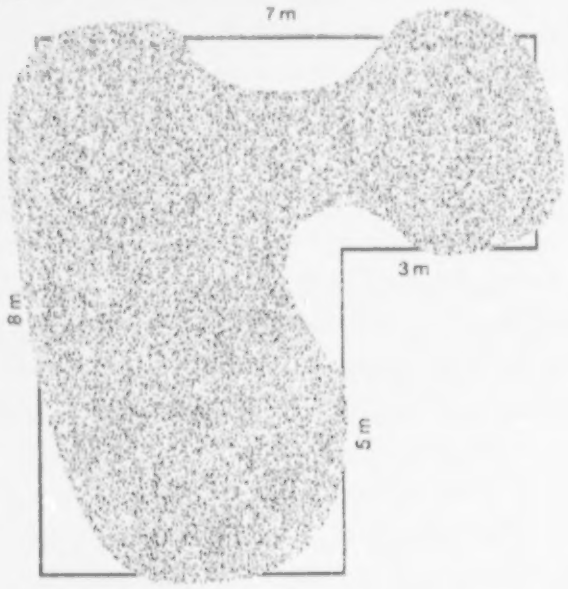
BEST COPY AVAILABLE

Sample activities

- Discuss finding the perimeter of composite shapes, such as rooms, which are not drawn to scale and do not have all the measurements included, and devise ways of finding the lengths of all the edges.
- Practise finding the perimeter of plans with some missing lengths, using plans drawn on plain paper so that missing lengths must be calculated from the information on other edges.
- Use plans drawn on plain paper to find the areas of composite shapes. Calculate any missing dimensions, and use a formula to find the area of each component.

Estimating areas

In the real world, shapes don't always come with straight lines. A flower bed or lawn may not be rectangular. Show learners how to estimate areas by using the measurements of approximate composite shapes.



- Discuss how volume is found (for regular shapes) by finding the area of the 'end' and multiplying this by the 'length'. Apply this knowledge to finding a formula for the volume of a cylinder.
- Use the formula for the volume of a cylinder to find the volume of different-sized cylinders, using the correct units in all cases.

- Discuss scales and how they are used. Work from examples such as *If the scale is 1:100 on a plan, what would a centimetre represent?, What would 10 cm represent?*
- Provide simple plans and scale drawings, with different scales, and work out actual measurements, e.g. house plans, room plans, templates for making something, etc. Use different scales, e.g. 1:20, 1:10, 1:50.

Sample activities

- Investigate different representations of 3-D objects in 2-D, e.g. nets of solids, plans, elevations.
- Describe 3-D objects from 2-D representations.
- Extract measurements from plans and elevations.
- Explore different 3-D images in a graphics package, or use 'Draw' in Word.

- Discuss practical examples of using parallel lines, e.g. hanging wallpaper, laying tiles or paving stones.
- Use the properties of parallel lines to solve everyday problems, e.g. finding the amount of coving needed to go round a ceiling by using the corresponding floor measurements.

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At this level, adults can

read and understand information given by numbers and symbols in simple graphical, numerical and written material

specify and describe a practical problem or task using numbers and measures

generate results which make sense and use given methods and given checking procedures appropriate to the specified purpose

present and explain results which show an understanding of the intended purpose using appropriate numbers, measures, objects or pictures

Data HD1/E1

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ extract simple information from lists – understand that lists can be ordered in different ways, e.g. alphabetically, numerically, and that not all lists are ordered in a logical way	Find an emergency telephone number from a short contact list.
❷ sort and classify objects using a single criterion – understand the concept of a criterion, e.g. a single feature such as colour, shape, gender	Sort bottles by colour for disposal at a bottle bank.
❸ construct simple representations or diagrams, using knowledge of numbers, measures or shape and space – understand that the purpose of representations is to communicate information – understand that information can be represented in different ways	Write a shopping list with multiple items.

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Sample activities

- Practise accessing information from simple lists, e.g. an emergency phone number, quantities on a shopping list, a room number or phone extension from a personnel list, quantities on a picking list.
- Practise finding phone numbers stored in a mobile phone.

- Discuss the concept of classification and criteria using practical examples, e.g. sorting items for recycling (paper, glass, plastic), books arranged by subject, music classified by type, etc.
- Relate to other areas of the curriculum, e.g. classifying 2-D and 3-D shapes; classifying items by size (e.g. clothes), capacity (drinks, paint), etc.

- Look at different ways of representing information, e.g. a numbered list, a shopping list, pictorial representations, simple pictograms, colour coding, simple diagrams, etc.
- Write a short list in Word, and use the automatic numbering button to number the items.
- Use Clip Art or Symbols to create simple representations in Word of the group activity, or other tasks.

Collecting and presenting data - group activity

Conduct a simple survey within the group, e.g. number of smokers/non-smokers, number of meat-eaters/vegetarians, etc. Present results in different ways, e.g. pictorially, numerically. Discuss different representations and interpret results, e.g. *There are more smokers than non-smokers.*

This activity can be undertaken using skills in sorting, counting and comparing, and introduces the concept of collection, categorisation and representation of data in preparation for work at higher levels.

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ENTRY LEVEL 2

At this level, adults can

read and understand
information given by numbers, symbols, simple diagrams and charts in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and simple shapes to record essential information

generate results
to a given level of accuracy using given methods and given checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, simple diagrams and symbols

Data HD1/E2

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ extract information from lists, tables, simple diagrams and block graphs – understand that tables are arranged in rows and columns – understand that a title, labels, etc. provide information	Extract information of interest from sports league tables, fixture lists, etc. Extract information from charts in a holiday brochure (e.g. average daily hours of sunshine, rainfall, temperature) for a chosen month.
❷ make numerical comparisons from block graphs – understand that the height of the bar indicates the numerical value in that category, and so values are compared through the heights of bars – understand that titles, labels, etc. provide essential information	Compare temperatures at holiday destinations using charts in brochures.
❸ sort and classify objects using two criteria – understand the concept of a criterion, e.g. a feature such as colour, shape, gender, height	Sort clothes for a jumble sale by size and person, e.g. men's/women's/children's.
❹ collect simple numerical information – understand the need to be clear about what information is required prior to collection – understand that information can be recorded in different ways	Carry out a survey on the preferred day of the week for meetings.
❺ represent information so that it makes sense to others (e.g. in lists, tables and diagrams) – understand that information can be represented in different ways, e.g. a list, a table, a diagram – understand the importance of labelling information in tables and diagrams	Represent the results of a survey to show the preferred day of the week for meetings in the form of a table or as a simple bar chart. Produce a simple timetable to plan and manage their own learning.

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Sample activities

- Extract information from simple price lists, menus, catalogues, brochures.
- Describe the layout of a room from a simple plan.
- Read measurements in metres from a simple floor plan of a room.
- Read dimensions in centimetres from simple diagrams or tables in a catalogue.

- Discuss simple block graphs in newspapers, magazines, holiday brochures, and extract some information from titles, labels, and by identifying largest category, etc.
- Use simple block graphs on topics of interest to practise making numerical comparisons.

- Discuss the concept of classification and criteria using examples, such as (simplified) public information reports (e.g. figures for health, crime, drug addiction, employment, etc. by age group and gender), books classified by subject and author.
- Relate the concept to other areas of the curriculum, e.g. classifying shapes by properties.

- Collect data through surveys in the group, e.g. the mode of transport to work/class. Discuss: possible ways to record data, e.g. a simple tally against categories, how to determine categories, the need for the category 'other'.

- Provide simple sets of data and discuss suitable ways of representing them – list, table, diagram.
- Sketch a simple room plan showing the location of the main features.
- Use the 'Insert Table' button in Word to create simple tables in which to represent information.
- Enter labels and data into two columns on a spreadsheet (e.g. days of the week, and hours spent on group activity).

Collecting and presenting data - group activity

Choose a common activity on which to collect individual data using measurement of time, e.g. number of hours spent watching TV, number of hours spent on housework, number of hours spent studying. Collect and record data to the nearest hour, each day for one week.

When data has been collected, discuss how to present it in a bar chart, e.g. days on one axis, number of hours on the other; does it matter which way round? Discuss possible scales, taking account of maximum daily number of hours to be represented.

Learners present own data in a vertical or horizontal bar chart. Compare charts and discuss results, e.g.: How easy are charts to interpret? Are there individual or common patterns (for example, more hours spent on the activity at the weekend than on weekdays)?

In the group, discuss what learners might expect to happen if the survey were repeated. Extend discussion to large-scale surveys and what might influence results, e.g. when the survey takes place, who is questioned, what happens when results are combined for a group. (The last point introduces the concept of average for work at higher levels; the individual charts can be compared to identify possible common patterns, differences, or extremes, and lead to discussion about why social data might not appear to reflect individual habits.)

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ENTRY LEVEL 3

At this level, adults can

read and understand
information given by numbers, symbols, diagrams and charts used for different purposes and in different ways in graphical, numerical and written material

specify and describe
a practical problem or task using numbers, measures and diagrams to collect and record relevant information

generate results
to a given level of accuracy using given methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using appropriate numbers, diagrams, charts and symbols

Data HD1/E3

Skills, knowledge and understanding	Example
Adults should be taught to:	
❶ extract numerical information from lists, tables, diagrams and simple charts – understand that the title, labels, key, etc. provide information – use a scale to extract numerical values	Extract information from a price list. Extract information from a parts database. Use a map to locate local amenities and services.
❷ make numerical comparisons from bar charts and pictograms – understand that comparisons can be made from the height or length of bars, or the number of pictures – understand that a picture or icon in a pictogram can represent more than one, but that each picture or icon represents the same number	Compare output with targets on a bar chart.
❸ make observations and record numerical information using a tally – understand the importance of defining categories prior to collecting data – know what is meant by a tally – know that tally marks have to be counted up to give a frequency	Collect data on TV advertising categorised by product type (food, cars, Internet services, etc.) during peak viewing time on one channel in one evening. Collect data relevant to work, training or leisure interests.
❹ organise and represent information in different ways so that it makes sense to others – know how to present data in tables, charts and diagrams – know how to use a simple scale to represent data in a bar chart or pictogram – understand the different elements in charts, e.g. the title, axis, scale, key – label diagrams and charts	Represent collected data on TV advertising in a bar chart. Represent collected data relevant to work, training or leisure interests in a suitable form.

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Sample activities

- Extract information from tables in price lists, catalogues, brochures, web sites (e.g. travel and holiday sites).
- Follow directions on a simple local map.
- Interpret simple diagrams, e.g. room plans, dimensions.
- Discuss and interpret information from straightforward charts in newspapers, magazines, etc. Identify the key elements. What information is given, what is missing (e.g. title, year, number in survey, etc.)?
- Extract numerical information from given charts.

- Identify the scale on the axis of a bar chart. Identify the categories, using the key if necessary. How do learners compare the frequency (numerical value) in two categories (i.e. visual)? How do they compare the difference between them (the need for a scale)?
- Identify the scale on a pictogram. What does each picture or icon represent? Identify the categories. How do learners compare the frequency of two categories? How do they know the frequency (value) of a category? How do they find the difference between two categories?
- Use bar charts and pictograms with appropriate scales on topics of interest to practise making numerical comparisons.

- Look at forms that collect data. Identify and discuss the categories, e.g. ethnic origin – what are the choices?
- Agree sensible categories for different data collections, e.g. the number of people in a household (e.g. 1, 2, 3, 4, more than 4), month of birthday, traffic survey (all vehicles? by category, such as car, bus, heavy lorries?).
- Collect data in a tally chart.
- Translate the tally chart into a frequency table.

- Display the data gathered above in a suitable table, bar chart or pictogram.
- Provide simple sets of data for learners to represent in different ways.
- Explore different graphic representations using a spreadsheet program.

Collecting and presenting data - group activity

In a group, choose a topic and design a simple data collection sheet that learners can use to collect data by category, using a tally, e.g. *If there were an election tomorrow, how would you vote? Labour, Conservative, Lib Dem, Other, Won't vote?*

Each learner to collect data from up to five people (depending on number of learners in the group). When data has been collected, combine tallies on a flip chart and work out frequencies. Discuss how to present the data in a bar chart, e.g. what will go on each axis, what is a suitable scale. Each learner to draw a bar chart, including title and labels. Compare and interpret results.

Discuss how social data is collected and presented, e.g.: representative samples; grouped according to age, gender, social class (can introduce Registrar General's classifications). Discuss what changes would be necessary to the data collection sheet to repeat the group survey to show voting intentions by gender. How could this data be presented in a bar chart? Why might results from the group survey differ from national surveys (e.g. size of sample, not representative)?

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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

read and understand straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results which meet the intended purpose using an appropriate format to a given level of accuracy

Data and statistical measures HD1/L1

Skills, knowledge and understanding	Example
Adults should be taught to:	Use a local map.
⓫ extract and interpret information (e.g. in tables, diagrams, charts and line graphs) – understand that the title, labels, key, etc. provide information – know how to read the scale on an axis – know how to use a simple scale such as 1 cm to 1 m – know how to obtain information from a pictogram, pie chart, bar chart, single-line graph, including use of decimal numbers	Extract information from price lists, catalogues, holiday brochures, etc.
⓬ collect, organise and represent discrete data (e.g. in tables, charts, diagrams and line graphs) – know how to choose a sensible scale to fit the data – label charts, graphs, diagrams	Collect data relevant to work, training or leisure interests, and represent it in a suitable format. Represent the collected data relevant to work, training or leisure interests.
⓭ find the arithmetical average (mean) for a set of data – know that the mean is one sort of average (the most common) – know that the mean is worked out by adding up the items, and dividing by the number of items – understand that the mean can give a 'distorted average' if one or two values are much higher or lower than the other values, e.g. the mean salary or wage in a company can be distorted by one or two very high salaries	Find the average age of people in a group. Find the goal average of a football player.
⓮ find the range for a set of data – understand that the range measures the spread of a set of data – understand that the range is the difference between the smallest and largest values in the set of data	Calculate the range in a patient's temperature in a 24-hour period.

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Sample activities

- Extract information from tables in price lists, catalogues, brochures, web sites.
- Extract and interpret information from straight-line graphs such as conversion graphs, sales figures, temperature charts, etc.
- Interpret diagrams or drawings in a practical context, e.g. floor plans, simple assembly instructions.
- Interpret information found in the newspapers following a budget. The changes are often displayed in bar charts, pie charts, line graphs or in tabular form.

Interpreting and presenting data

There are many textbooks and other learning materials that provide exercises in interpreting and presenting data in charts and graphs. These will mostly use simplified data and scales to enable learners to develop skills in handling data.

However, in everyday life data tends to be more complex, and learners need to understand that charts and graphs can be used to persuade and mislead as well as to inform. Collect a range of materials to illustrate this and use as the basis for discussion, e.g. charts and graphs from adverts, newspapers, reports. To encourage learners to ask critical questions, prepare statements about a chart or graph and, in the group, discuss which ones can be validated from the information available (these could be in a variety of styles, including newspaper headlines making bold claims).

In practical tasks, ask learners to explore different ways of presenting the same set of data, not just different formats, but using different scales for the same format. For example, what is the visual effect on the slope of a line graph of choosing a different scale? What is the effect if the scale doesn't start at zero? Although learners are less likely to present data in everyday life, these activities can help to develop skills in the critical interpretation of charts and graphs.

- Identify suitable methods for collecting and recording different data, e.g. counting (stock checks), tally (e.g. traffic flow, oral survey), questionnaire and analysis (written survey).
- Represent given sets of data in suitable ways.
- Explore different graphic representations using a spreadsheet program. Discuss appropriate presentations for different sorts of data.
- Practise drawing simple plans (not to scale), e.g. room plans, piece of equipment.

- Find the mean of given sets of data, such as wages, temperatures, house prices, rainfall, daily attendance in a week (e.g. at a visitor attraction, club), daily/weekly/monthly sales totals.

- Consider everyday examples of the use of the word *range* and what it means, e.g. *price range, age range*, etc.
- Find the range of given sets of data, such as wages, temperatures, house prices, rainfall, daily attendance in a week (e.g. at a visitor attraction, club), daily/weekly/monthly sales totals.

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See also in the key skills: Application of number key skills level 1
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N1.1, N1.2, N1.3

At this level, adults can

read and understand
straightforward mathematical information used for different purposes and independently select relevant information from given graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to make accurate observations and identify suitable calculations to achieve an appropriate outcome

generate results
to a given level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
which meet the intended purpose using an appropriate format to a given level of accuracy

Probability HD2/L1

Skills, knowledge and understanding

Adults should be taught to:

1. show that some events are more likely to occur than others
   - understand that some events are impossible
   - understand that some events are certain to happen
   - know that some events are more likely to occur than others
   - understand the concept of possible outcomes, e.g. there are two possible outcomes for the gender of a baby
   - understand that some events can happen in more than one way, e.g. there are three possible ways of getting an odd number with the throw of a die
   - understand that probability is an expression of likelihood, and use terms such as *a one in two chance*

Example

Show that you are more likely to get an odd number than a six with a single throw of a die.

2. express the likelihood of an event using fractions, decimals and percentages with the probability scale of 0 to 1
   - understand that the likelihood of an event is measured on a scale from 0 (impossible) to 1 (certain)
   - understand that likelihood (or probability) is expressed as the number of ways the event can happen divided by the total number of possible outcomes
   - understand that likelihood or probability can be written as a fraction, decimal or percentage, e.g. the likelihood that a coin will land heads-up is 50%, .5 or ½ – the expression *there is a fifty-fifty chance* is an expression of likelihood using percentages

Express as a percentage the likelihood that a baby will be a girl.

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Sample activities

- Discuss events in terms of likelihood: what is certain to happen; what cannot happen; what might happen (but is it likely or unlikely)?
- Discuss probability in relation to the insurance of cars, property, travel, e.g. why is the premium for health insurance for a skiing holiday more than that for a camping holiday?
- Consider questions such as: are you more likely to get a head if you toss a coin, or throw a six with a roll of a die? Why? Investigate the concept of possible outcomes.
- Discuss the likelihood of particular events e.g. getting a head on the toss of a coin, getting a six on the throw of a die, picking an ace from a pack of cards, having a birthday in July by:
  (a) discussing and recording possible outcomes;
  (b) identifying the number of ways the event can happen;
  (c) describing the likelihood of the event as a one in two chance, a one in six chance, a 4 in 52 chance, a 1 in 12 chance, etc.

- Match events to probabilities using 0 (can't happen), 1 (certain to happen), 0.5 (equally likely outcome – fifty-fifty chance), e.g. *that I will die one day, that I shall live forever, that a baby will be a boy.*
- Discuss ways of comparing the likelihood of events using examples in the previous section, e.g. how to compare a one in two chance with a one in six; a 1 in 12 chance with a 4 in 52.
- Express the probabilities in the examples above (and other simple examples) as fractions, decimals and percentages.
- Use real or simulated data to calculate probabilities, e.g. if a photocopy machine is out of action on average 1 day in 10, what is the probability it will not work today? Using rainfall statistics, what is the chance of getting wet going out in a given month?

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See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand
mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results
to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Data and statistical measures HD1/L2

Skills, knowledge and understanding	Example
Adults should be taught to:	
① extract discrete and continuous data from tables, diagrams, charts and line graphs – understand how to use scales in diagrams, charts and graphs – know how to interpret information from bar charts, pie charts, and line graphs with more than one line	Extract information from a holiday brochure (dates, flight times, costs, supplements, reductions, insurance, etc.).
② collect, organise and represent discrete and continuous data in tables, charts, diagrams and line graphs – understand that continuous data is collected through measurement – understand that continuous data can only be collected to a certain degree of accuracy – know how to choose a suitable scale to fit the data – label charts, graphs, diagrams	Measure a patient's temperature at regular intervals and represent it in a line graph. Measure a baby's weight at weekly intervals over a period of time and record it in a line graph.
③ find the mean, median and mode, and use them as appropriate to compare two sets of data – understand what is meant by *mean*, *median* and *mode* – understand that each average is useful for different purposes	Compare the mean and median house prices from local data.
④ find the range and use it to describe the spread within sets of data – understand that the range is the difference between the highest and lowest values in a set of data	Compare the rainfall in two locations. Compare the distribution of pay scales in two organisations.

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Sample activities

- Discuss the difference between continuous and discrete data. A useful example is that the size of shoe someone wears is discrete, but the length of their foot is continuous.
- Look at graphical representations of discrete and continuous data – line graphs for continuous data, e.g. conversion graphs.
- Extract information from tables in price lists, catalogues, brochures, web sites.
- Discuss the information produced by local councils to explain how their money is spent.
- Examine *Social Trends* (The Stationery Office) or other government publications.
- Discuss the key elements of line graphs. Look at the use of different scales and their effect on the graph. Look at trends from the slope of the graph.

- Take temperature readings over a period of time and represent them in a line graph.
- Measure the growth of a plant over a period of time and represent it in a line graph.
- Collect and record data from exchange rates or a particular share issue over a period of time. Display the data in a table or graph.
- Use given sets of data and represent them in a suitable form.
- Explore different graphic representations using a spreadsheet program.

- Discuss the use of *mean*, *median* and *mode*. Why is the median sometimes a 'better average' than the mean (e.g. average earnings may be distorted by very high salaries)? When might mode be used (e.g. the truancy rate against the age or year group)?
- Compare sets of data using data collected in the above activities. Compare them with the data collected by another person who has undertaken a similar survey. Compare them with published results. Compare them with the performance of currency or shares from a previous time period.
- Enter a formula in a spreadsheet to calculate the mean of a set of data. Explore the AVERAGE, MEDIAN and MODE functions (under 'Insert: Function, Statistical' in Excel).

- Consider the use of range in everyday language, e.g. *price range*, *age range*.
- Compare the range in given sets of data, e.g. the range in the monthly rainfall at two different places (if possible, places with a similar annual total but different range, e.g. Niagara Falls and Mexico City).
- Collect data of interest and compare the range, e.g. local house prices with those in another area, local council tax bands with those of another council.

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See also in the key skills: Application of number key skills level 2
Part A: In interpreting information . . .
In carrying out calculations . . .
In interpreting results and presenting your findings . . .
Part B: N2.1, N2.2, N2.3

At this level, adults can

read and understand
mathematical information used for different purposes and independently select and compare relevant information from a variety of graphical, numerical and written material

specify and describe
a practical activity, problem or task using mathematical information and language to increase understanding and select appropriate methods for carrying through a substantial activity

generate results
to an appropriate level of accuracy using methods, measures and checking procedures appropriate to the specified purpose

present and explain results
clearly and accurately using numerical, graphical and written formats appropriate to purpose, findings and audience

Probability HD2/L2

Skills, knowledge and understanding

Adults should be taught to:

⑪ identify the range of possible outcomes of combined events and record the information using diagrams or tables

- understand that events are independent when the outcome of one does not influence the outcome of another, e.g. the gender of a baby does not influence the gender of a second one
- understand that events are combined when the outcome depends on the separate outcome of each independent event, e.g. the likelihood that twins will both be girls
- record the range of possible outcomes of combined events in tree diagrams or in tables

Example

Identify the possible outcomes of the gender of twins.

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Sample activities

- Discuss the possible outcomes of an event using simple examples such as tossing a coin, picking a single playing card from a pack, throwing a die, the possible gender of a baby, the outcome of a football match for one team, etc.
- Think of examples where all possible outcomes can be identified. Contrast these with examples where it is difficult (too many possible outcomes) or impossible (outcomes not known) to identify all outcomes.
- Show how the outcomes of combined events can be recorded in a table and a tree diagram, e.g. the outcome of tossing two coins, throwing two dice, the possible genders of twins, triplets, etc.
- Use a spreadsheet or Word table to record the possible outcomes of combined events.

Recording outcomes in tables or diagrams

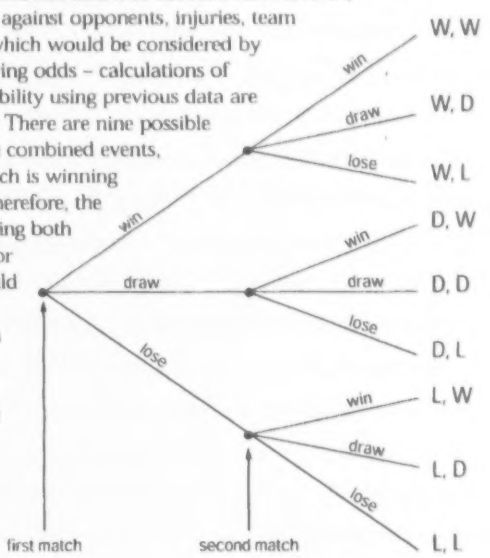
What is the most likely score on the roll of two dice? What are the chances of scoring 12? Questions like these can be answered by setting out possible outcomes in a table.

outcome on second die \ outcome on first die	1	2	3	4	5	6
1	2	3	4	5	6	7
2	3	4	5	6	7	8
3	4	5	6	7	8	9
4	5	6	7	8	9	10
5	6	7	8	9	10	12
6	7	8	9	10	11	12

The top row of the table shows the possible outcomes of the roll of the first die; the first column shows the possible outcomes of the roll of the second die. The shaded part of the table shows the combined score of the two dice for every possible outcome. It is easy to see from the table that 7 is the most likely score – it occurs six times out of 36 possible outcomes. Therefore, the probability of scoring 7 is 6 out of 36, or one-sixth. There is only one possible way of scoring 12 (two sixes), therefore the probability of scoring 12 is $^1/_{36}$. You are six times more likely to score 7 than 12.

A football team needs to win both its remaining matches to score maximum points and win the league. What are the chances of them winning both games?

The possible outcomes of the two matches can be shown in a tree diagram. For each match there are three possible outcomes: win (W), draw (D), lose (L). (Theoretically the outcomes are equally likely, but this does not take into account current form, previous results against opponents, injuries, team selection, etc., which would be considered by bookmakers giving odds – calculations of empirical probability using previous data are more complex.) There are nine possible outcomes of the combined events, only one of which is winning both games. Therefore, the chances of winning both games is 1 in 9 or 0.111 – you could say there is approximately a 10% chance of winning both games, and thus the league!



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Glossary

2-D, 3-D	two-dimensional, three-dimensional. Having two or three dimensions respectively.
analogue clock	an analogue clock usually has 12 equal divisions around the perimeter/circumference, labelled 1 to 12 to represent hours. It has two hands that rotate about the centre. The hour hand completes one revolution in 12 hours, and the minute hand completes one revolution in one hour.
angle	a configuration of two line segments meeting at a point. The term is often used for the measure of rotation from one of the line segments to the other. In this sense, a right angle measures 90°, an acute angle is less than 90°, an obtuse angle is greater than 90° but less than 180°, and a reflex angle is greater than 180°.
approximation	a result that is not exact but sufficiently close to be useful in a practical context. Verb: approximate. Adverb: approximately.
area	a measure of a surface. Measured in squares, e.g. square centimetres (cm^2), square metres (m^2).
average	sometimes used synonymously with arithmetic 'mean'. More widely, measures of average include mean, median and mode.
bar chart	a particular form of representation of data. Frequencies are represented by bars of equal width where the lengths are proportional to the frequencies. The bars may be presented vertically or horizontally.
block graph	a particular form of representation of grouped data. In its simplest form, where the class intervals are equal and rectangles have bases of the same size, the block graph can be considered as a bar chart, and the length of each rectangle represents the total in each class.
calculate efficiently	use knowledge of number systems and operations, e.g. use multiplication rather than repeated addition. In the context of using tools, to use available operations and functions, e.g. memory and constant functions on a calculator, sum formula in a spreadsheet for a range of cells, rather than addition of individual cells.
capacity	volume, i.e. a measure in three-dimensional space, applied to liquids, materials that can be poured, or containers. Units include cubic centimetres (cm^3), cubic metres (m^3). *Note* – a litre is 1000 cm^3 (the volume of 1 kg of water).
cardinal number	a counting number. Example: one, two, three, etc.
circumference	sometimes used for the boundary of a circle but more usually the length of the boundary. If the radius of a circle is r units, and the diameter d units, then the circumference is $2\pi r$, or πd units.
combined events	a set of independent events with a single outcome. An independent event does not influence a subsequent event: for example, one throw of a die does not influence a second throw. Two throws of a die is a combined event with 36 possible outcomes (6 x 6). The probability of throwing two sixes is $^1/_{36}$.
common	an adjective used to describe units, instruments, measures, date formats, etc. that are widely used in everyday life in non-specialist contexts.
common fraction	a fraction where the numerator and denominator are both integers. Also known as a simple or vulgar fraction.
commutative	an operation * is commutative if a * b = b * a. Addition and multiplication are commutative where 2 + 3 = 3 + 2 and 2 × 3 = 3 × 2. Subtraction and division are not commutative.
composite shape	an irregular shape which can be partitioned into two or more regular or simple shapes, e.g. an L-shape made up of two rectangles.
continuous data	data resulting from measurement, e.g. length, temperature. Continuous data can take any value between two values, and can only be measured approximately to a certain degree of accuracy. Continuous data are usually represented by a line.
cuboid	a three-dimensional figure with six rectangular faces. Adjoining edges and faces are at right angles. (One pair of opposite faces may be square.)
data	information of a quantitative nature consisting of counts or measurements: where they refer to items or events that are separate and can be counted, the data are discrete; where they refer to quantities such as length or capacity that are measured, the data are continuous. Singular: datum.

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decimal	relating to base ten. Most commonly used synonymously with decimal fraction, where the number of tenths, hundredths, thousandths, etc. are represented as digits following a decimal point. The decimal point is placed at the right of the units column. Each column after the decimal point is a decimal place: for example, the decimal fraction 0.275 is said to have three decimal places. The system of recording with a decimal point is decimal notation.
digit	one of the symbols of a number system, most commonly the symbols 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9. The number 29 is a two-digit number, for example, but there are three digits in 2.95. The position of the digits conveys place value.
digital clock	a digital clock is usually a 24-hour clock. It displays the time as hours and minutes past midnight: for example, four-thirty in the afternoon is displayed as 16:30. A 12-hour digital clock displays hours past midnight and midday and uses a.m. and p.m. to differentiate.
direct proportion	two quantities or variables are in direct proportion when they increase or decrease in the same ratio: for example, if 5 oranges cost £1, and 10 cost £2, then cost is in direct proportion to quantity – they both double, or both halve; expressed mathematically as $y = kx$ where k is constant.
discrete data	data resulting from a count of separate items or events, e.g. number of people.
distribution	in recording data, the way in which values in the set of observations are arranged.
distributive	one operation $\square$ is distributive over another $*$ if $a \square (b * c) = (a \square b) * (a \square c)$. Example: Multiplication is distributive over addition where $4 \times (50 + 6) = (4 \times 50) + (4 \times 6)$. Multiplication is distributive over subtraction where $4 \times (50 - 2) = (4 \times 50) - (4 \times 2)$. Division is not distributive over other operations.
equivalent fraction	fraction with the same value as another, e.g. $^6/_{12} = {}^1/_2 = {}^1/_2$; these fractions are equivalent.
estimate	to arrive at a rough answer by calculating with suitable approximations for numbers or, in measurement, by using previous experience.
evaluate (an expression)	to work out the value of an expression when numbers have been substituted for variables.
event	used in probability to describe the outcome of an action or happening.
everyday	an adjective used to describe numbers, measures, units, instruments, etc. that fall within the daily lived experience of most people in non-specialist contexts.
expression	a mathematical statement involving variables written in words or symbols, e.g. length × width, $a \times b$ (or ab).
factor	when an integer can be expressed as the product or two or more other integers, these are factors of the first. Example: $24 = 6 \times 4$, so 6 and 4 are factors of 24. A prime factor is a factor that is a prime number.
familiar	describes contexts, situations, numbers, measures, instruments, etc. of which the learner has some prior knowledge or experience.
formula	any identity, general rule or mathematical law. Plural: formulae.
frequency table	a table for a set of observations showing how frequently each event or quantity occurs.
grouped data	observed data arising from counts and grouped into non-overlapping intervals, e.g. number of people in different age-groups with intervals 0–9, 10–19, 20–29, 30–39, 40–49, etc.
imperial unit	a unit of measurement historically used in the United Kingdom and other English-speaking countries. Units include inch, foot, yard, mile, acre, ounce, pound, stone, ton, pint, quart and gallon. Now largely replaced by metric units.
integer	any of the positive or negative whole numbers including zero, e.g. ..−2, −1, 0, 1, 2..
inverse operations	operations that, when they are combined, leave the entity on which they operate unchanged: for example, addition and subtraction are inverse operations, e.g. $5 + 6 - 6 = 5$; multiplication and division are inverse operations, e.g. $6 \times 10 \div 10 = 6$.
line graph	a diagram showing a relationship between two variables.

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line symmetry	also reflective symmetry. The property of a shape where one half is a reflection of the other; the 'mirror line' is the axis of symmetry or line of symmetry.
mass	a fundamental characteristic of a body, relating to the amount of matter within it. Mass differs from weight, the force with which a body is attracted towards the earth's centre. Under certain conditions a body can become weightless, whereas mass is constant.
mean	a type of average. The arithmetic mean is the sum of quantities divided by the number of them: for example, the arithmetic mean of 5, 6, 14, 15 and 45 is (5 ■ 6 ■ 14 ■ 15 ■ 45) ■ 5 = 17.
median	a type of average. The median is the middle number or value when all are arranged in ascending order: for example, the median of 5, 6, 14, 15 and 45 is 14. Where there is an even number of values, the arithmetic mean of the two middle values is calculated: for example, the median of 5, 6, 7, 8, 14 and 45 is (7 ■ 8) ■ 2 = 7.5.
metric	relating to the decimal system of measurement based on the metre, kilogram and second.
metric unit	unit of measurement in the decimal system. Metric units include metre, centimetre, millimetre, kilometre, gram and kilogram.
mixed fraction	a whole number and a fractional part expressed as a common fraction, e.g. $1\frac{2}{3}$ is a mixed fraction; also known as a mixed number.
mixed number	a whole number and a fractional part expressed as a common fraction, e.g. $1\frac{2}{3}$ is a mixed number; also known as a mixed fraction.
mode	a measure of average – the most frequently occurring in a set of data.
multiple	any number that has a given number as a factor is called a multiple of that factor. Example: 14 = 7 ■ 2, 49 = 7 ■ 7 and 70 = 7 ■ 10. So 14, 49 and 70 are all multiples of 7.
negative number	a number less than 0.
non-standard unit	unit of measure which is not fixed or widely agreed, e.g. pace, cup.
number bond	a pair of numbers with a particular total, e.g. number bonds to ten, all pairs of numbers with the total 10.
numeral	a symbol used to denote a number. The Roman numerals I, V, X, L, C, D and M represent the numbers one, five, ten, fifty, one hundred, five hundred and one thousand. The Arabic numerals 0, 1, 2, 3, 4, 5, 6, 7, 8 and 9 are used in the Hindu-Arabic system giving numbers in the form that is widely used today.
operation	a means of combining numbers, sets or other elements. Addition, subtraction, multiplication and division are four operations on numbers.
ordinal number	a term that describes a position within an order, e.g. first, second, third, fourth . . . twentieth, etc.
parallel	always equidistant. Parallel lines never meet, however far they are produced. Parallel lines must lie in the same plane.
pattern	a systematic arrangement of numbers, shapes or other elements according to a rule.
percentage	a fraction expressed as the number of parts per hundred and recorded using the notation *num*[illegible] one half can be expressed as 50%, the whole can be expressed as 100%.
perimeter	the length of the boundary of a closed figure.
pi (π)	the symbol used to denote the ratio of the circumference of a circle to its diameter. Approximately 3.142.
pictogram	a particular form of representation of data. Suitable pictures/symbols/icons are used to represent objects. For large numbers one symbol may represent a number of objects; a part symbol then represents a rough proportion of the number.
pie-chart	a particular form of presentation of data. A circle is divided into sectors. The frequency or amount of each quantity is proportional to the angle at the centre of the circle.
place value	the value of a digit that relates to its position or place in a number, e.g. in 1481 the digits represent thousands, hundreds, tens and units respectively. The value of the 1 on the left is one thousand while the value of the 1 on the right is one.
prime number	a prime number has exactly two factors, itself and 1. Examples: 2 (factors 2, 1), 3 (factors 3, 1); 51 is not prime (factors 51, 17, 3, 1), and 1 itself is not considered a prime number.

probability	the likelihood of an event happening; a measure of certainty. Probability is expressed on a scale from 0 to 1. Where an event cannot happen, its probability is 0 and, where it is certain, its probability is 1. The probability of scoring 1 with a fair die is ⅙.
product	the result of multiplication, e.g. the product of 2, 3 and 4 is 24 (2 ■ 3 ■ 4).
property	any attribute, e.g. one property of a square is that all sides are equal.
quadrilateral	a polygon with four sides and four interior angles.
range	a measure of spread in statistics; the difference between the greatest and the least in a set of numerical data.
ratio	a comparison of quantities of the same kind, written a:b; for example, a mixture made up of two ingredients in the ratio 3:1 is 3 parts of the first ingredient to 1 part of the second; the first ingredient makes up ¾ of the total mixture, the second makes up ¼ of the total.
rectangle	a quadrilateral (four-sided polygon) with four right angles. The pairs of opposite sides are equal. If all sides are equal the rectangle is a square. Adjective: rectangular.
regular	a polygon is a regular polygon if all the sides are equal and all the internal angles are equal, e.g. a regular quadrilateral is a square. When referring to a shape, the adjective *regular* refers to common 2-D or 3-D shapes whose areas can be found using a formula, e.g. a rectangle, circle, cylinder.
right angle	one quarter of a complete turn. An angle of 90 degrees. An acute angle is less than one right angle. An obtuse angle is greater than one right angle but less than two. A reflex angle is greater than two right angles.
round *(verb)*	to express a number or measurement to a required degree of accuracy, e.g. 543 rounded to the nearest 10 is 540.
scale	a measuring device usually consisting of points on a line with equal intervals.
sequence	a succession of terms formed according to a rule, in which there is a definite relation between one term and the next and between each term and its position in the sequence, e.g. 1, 4, 9, 16, 25, etc.
sign	a symbol used to denote an operation, e.g. addition sign ■, subtraction sign −, multiplication sign ■, division sign ■. In the case of directed numbers, the positive ■ or negative − sign indicates the direction in which the number is measured from the origin along the number line.
simple	an adjective applied to numbers, information, diagrams, charts, etc. that make limited demands on the learner, for example: small whole numbers; numbers that are easier to work with, e.g. multiples of 2, 5 10, 100; uncomplicated representations of limited amounts of data, etc.
square number	a number that can be expressed as the product of two equal numbers, e.g. 36 = 6 ■ 6, and so 36 is a square number.
standard unit	units that are agreed throughout a community, e.g. the metre is a standard unit of length. Non-standard units are not widely agreed.
straightforward	describes information, subjects and materials that learners often meet in their work, studies or other activities.
substantial activity	an activity that includes a number of related tasks, where the results of one task will affect the carrying out of the others.
substitute	to assign a value to a variable.
symbol	a letter, numeral or other mark that represents a number, an operation or another mathematical idea: for example, V is the Roman symbol for five, > is the symbol for 'is greater than'.
symmetry	a figure has symmetry if parts can be interchanged without changing the whole. A geometric figure may have reflective symmetry or rotational symmetry. Adjective: symmetrical.
system (of measure)	an agreed system of measure in which units are defined and are in a fixed relationship to each other.

table	an orderly arrangement of information, numbers or letters, usually in rows and columns.
tally	to make marks to represent objects counted.
tessellation	a surface in a plane covered by the transformation (translation, reflection, rotation) of a single shape. Verb: tessellate.
unit	one. A standard used in measuring, e.g. a metre is a metric unit of length.
unit fraction	a fraction that has 1 as the numerator and whose denominator is a non-zero integer, e.g. $\frac{1}{2}$, $\frac{1}{3}$.
volume	a measure in three-dimensional space, measured in cubes, e.g. cubic centimetres (cm^3), cubic metres (m^3).
weight	the force with which a body is attracted towards the earth's centre. In non-scientific contexts, often used synonymously with mass (though technically different). Metric units of weight include kilograms (kg) and grams (g).

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